Compilation peer-review process

“Impacts of offshore wind farm expansion: what are the consequences for achieving Good Environmental Status across European marine waters?”

Contents

Background information for reviewers

Following the method protocol, the Offshore Wind Farms EWG has now drafted their work: a report that aims to assess the state of knowledge on the "Impacts of offshore wind farm expansion: what are the consequences for achieving Good Environmental Status across European marine waters?

The draft report can be found on the Eklipse website and is open for consultation and review until June 26th, 2025. The final editing and formatting of in-text references and the reference list will be undertaken after the report's review. Eklipse is committed to ensuring the usability of all its products and is therefore organising an open review process of this draft report engaging a range of stakeholders. Thank you very much for your willingness to participate in this extended peer-review. This is an essential and critical phase to ensure the usability of the developed output.

Before starting the review process, we advise you to first go through the whole survey and to please read the following instructions:

1) The text will be language edited by a professional editor once the review is completed, so please do not worry about clumsy wording or typos; only indicate if there are problems of understanding.

2) The review form is composed of 5 pages. On this first page, please fill in your name and email address. Please note that in case you want your review to stay anonymous, your name and email will only be communicated to the Eklipse Management Body (EMB).

3) On Page 2, please find general questions on the report to help improve the usability of the report.

4) On Page 3, please add specific comments on the report, section by section—for example, the title, the knowledge synthesis framework and methodology, results, etc.

5) On Page 4, please comment on Annexes.

6) On Page 5, you can add further comments or general appreciation.

7) PLEASE note that by submitting your review, you will still be able to edit your responses and this until the end of the review period (June 26th, 2025). So if you are not finished with your review but would like to come back to it later, please click on "submit" your review (it is, in a way, a "save" button). You will then receive an email from Google form with an edit link.

Inquiries

If you need help or more information during the review process, please feel free to contact Eklipse at emb@eklipse.eu.

Eklipse is a science-policy mechanism in the public interest. The lawful basis for processing your personal data under the EU's General Data Protection Regulation (GDPR) will be a public task. Our privacy policy (http://eklipse.eu/privacy-policy/) contains further information on the purpose and lawful basis for processing your personal data.

Review from The Pelagic AC (PelAC) received by email (link to the review)

Comment: The Pelagic AC (PelAC) welcomes the opportunity to respond to the Call for Review of the draft report on "Cumulative impacts of offshore wind farm expansions: consequences & solutions for achieving GES across European marine waters" (link). Due to the tight deadline for responses, the PelAC was unable to provide a response using the prescribed online format. The PelAC provides consensus-based advice involving several internal review, consultation and approval procedures which require sufficient time for discussion and consensus building. Therefore, it was decided to provide a response in the format of an open letter.

Response: Thank you

Since 2020, the PelAC has collaborated extensively with the NWWAC on the topic of offshore renewable energy developments and potential effects on commercial fisheries, starting with the establishment of a joint Focus Group, and including:

- NWWAC/PELAC advice for non-recurrent request to ICES on seismic impacts (August 2020, link)
- NWWAC/PELAC/NSAC advice for a non-recurrent request to ICES on impacts of wind energy developments (November 2020, link)
- Workshop on the impacts of seismic and offshore wind energy developments on fisheries on May 2022 (link)
- Joint NWWAC/PelAC advice on the impacts of underwater noise and offshore wind energy developments on commercial fisheries (October 2022, link)
- Briefing on the Maritime Area Planning Act Ireland 2021, on January 2023 (link)
- Joint NWWAC/PelAC to the European Commission calling for increased policy coherence between environment and fisheries dimensions (June 2024, link)
- NWWAC/PelAC submission on the Ecological Sensitivity Analysis of the Celtic Sea to inform future designation of Marine Protected Areas (MPAs) Report (December 2024, link)
- NWWAC/PelAC Advice to the North Western Waters Member States group on renewable energy developments in the marine space, February 2025 (link)
- NWWAC/PelAC webinar on EU fisheries and ORE developments, February 2025 (link)
- NWWAC/PelAC Advice on the impact of Offshore Renewable Energy Developments on commercial fisheries, June 2025 (link)

Response: ok, thank you for explaining your involvement in the OWF development landscape. However, the timeline we worked with and the method choices did not allow us to explore grey literature, webinars, or events taking place on the topic. This is already acknowledged in the report (Page 29)

Comment: Research regarding potential impacts of ORE developments is increasing internationally as well as nationally, and it is vital that the ACs base their work and advice on the most up-to-date scientific knowledge. Therefore, the ACs regularly invite experts to dedicated meetings, and work carried out by Eklipse on the request put out by DG ENV was introduced to members of the Advisory Councils (ACs) in January 2025 at the meeting of the joint Focus Group Spatial Dimension (link).

Response: we appreciate the opportunity for presenting the work carried out by Eklipse.

Comment: During the discussion, AC members expressed their appreciation for the robustness of the methodology and the process. However, it was generally felt that the main issue seemed to be the lack of robust science as well as the knowledge gaps on the impacts on the marine environment, and the resulting limitation regarding the possibility of drawing conclusions from insufficient evidence. AC members are pleased to see this identified in the draft report "*This report underscores the need for a comprehensive, long-term, and integrated approach to assessing and managing the impacts of offshore wind energy production at sea, including cumulative impacts on marine ecosystems. Significant gaps in knowledge persist and addressing these gaps through improved monitoring, cross disciplinary research, new and standardised assessment methodologies and adaptive policy frameworks will be essential to ensure that Good Environmental Status is achieved."* It should be noted here that these shortcomings are inconsistent with the positive statements made elsewhere in the report.

Response: Thank you your appreciation of methods used and our process in general, yes, a comprehensive, long term and integrated approach to assess the cumulative impacts of offshore wind energy production at sea is absolutely crucial, and the focus should really be on cumulative impacts, as you pointed out, some slightly more positive statements on impacts will not persist if analysed in a cumulative manner, we have reflected on those seemingly positive statements throughout the report and hope to support the case for more cumulative assessments in the future.

Comment: The ambitious targets for development of offshore Marine Renewable Energy will mean increasing competition for space particularly in nearshore waters. Construction and operation of marine renewable energy will have implications for almost all descriptors. The PelAC notes that one of the key takeaways across all descriptors analysed in this project relates to knowledge gaps relating to impacts other than caused by fisheries. Fishing activity in European waters is extensively monitored and assessed; however, it is not the only human activity that can contribute (negatively or positively) towards the achievement of GES. A harmonised and equal approach to monitoring and assessing all commercial activities in the marine space must be implemented in order to arrive at a balanced evaluation. This must include quantification of the key economic effects on fisheries resulting from ORE development. All marine activities should be assessed based on their current societal value and ecological impact, with each held proportionately accountable for their impact.

Response: We could not agree more; however, the quantification of the key economic effects of all commercial activities is beyond the scope of our analysis and hence our report. However, we will push for more holistic assessments like this in the future.

Comment: The Eklipse report suggests that offshore wind turbines can act as artificial reefs, attracting certain marine species to their foundations. The impact of this known concept (Degraer et al. 2020) depends on spatial and temporal contexts and scales. Local food webs are affected, but production is not necessarily increased. Species might only aggregate near the new hard structures. The reef effect remains very localised and does not allow us to conclude that there is a net increase in biomass or an overall benefit for fisheries.

Response: Thank you for this comment. To clarify, we are not suggesting that OWFs act as artificial reefs. Rather, the scientific literature we gathered gives scientific evidence of the reef effect, albeit temporary and space-dependent. Please also note that the requesters were interested in "impacts" and "effects" of OWFs, so our report would be incomplete if we were to exclude the reef effect.

Comment: Furthermore, the report highlights the major disruptive effects of underwater noise, particularly during the piling of the foundations, which can cause many species to flee or become stressed. In the event where the initial disturbance is not mitigated well enough, the positive ecological role of wind turbines cannot be highlighted. A trade-off analysis between the initial impact of the deployment and the ecological gains obtained from the deployment of ORE is needed to achieve at minimum a no net loss or even a net positive outcome.

Response: The literature examined for the underwater noise descriptor was mainly related to construction. In this context, it highlighted some impacts in particular for the harbour porpoise. Not many other spp. Or taxa were present in the literature. We completely support the idea of the trade-off analysis between the initial impact of the deployment and the ecological gains, unfortunately, beyond the scope of the request, but definitely a future task.

Comment: Measuring the benefits of ORE deployment cannot happen without a rigorous pre- and post-installation monitoring and long-term follow-up. The report acknowledges these shortcomings but underlines some of the possible solutions. The PelAC would like to understand how the knowledge gaps of risks and opportunities provided by ORE deployment will be addressed. Additionally, the contribution of the identified potential nature enhancing opportunities to increased biodiversity and increased commercial fish stock production remains unclear.

Response: We completely agree, measuring the benefits of ORE deployment cannot happen without rigorous pre- and post-installation monitoring and long-term follow-up. We hope that our report serves as an evidence base (as it is intended) to raise these questions and provide future food for thought for upcoming assessments.

Comment: A credible assessment of the ecological effects of offshore wind projects can only be based on ecological monitoring that includes baseline data prior to installation and continuous monitoring after installation. Otherwise, the positive or negative effects remain unquantifiable, and environmental assessments risk being arbitrary.

Response: Thank you very much. As for our evidence report, monitoring has been highlighted in the policy recommendations discussed in the workshop and in the conclusions section. See, for example, page 94, lines 8-10, page 103, from line 35. We hope that future monitoring strategies and programmes will be built on the recommendations provided by our report.

Comment: In addition, assessment tools for potential impacts of ORE on both fisheries and the environment must be spatially adequate in order to assess any direct impacts from a development as well as potential cumulative impacts. Currently, assessments are carried out at different spatial resolutions, and a finer resolution in the analysis will better present the interactions between sectors and potential effects.

Response: Outcomes of the discussions from the participatory workshop are included in the report (see section on Workshop Summary of Findings), where needs for coherence and existing assessment tools for cumulative impacts are mentioned and will hopefully be taken up in the future.

Comment: Ocean governance and climate change are interconnected, requiring engagement and dialogue between researchers, citizens, stakeholders and decision makers. The commercial fishing sector plays an important role in achieving the objectives of the deliverable (GES) for several descriptors, which only strengthens the view of the importance of the inclusion of fisheries stakeholders in the management of the marine environment.

Response: To add clarity, this request is not about “managing the marine environment”, but about impacts and effects generated by offshore wind farm development. The request also does not deal with which sector is mostly involved or needs to be involved in achieving the objectives of the MSFD.

Comment: It is imperative to strengthen collaborations between industry and science in order to develop a full picture of the state of the environment and to understand the underlying premises for important and necessary trade-offs between nature conservation and resource utilisation.

Response: Please refer to the mission of Eklipse on the website (https://eklipse.eu/).

Comment: Advisory Councils, though operating in the framework of the CFP, should be able to reach those environmental policy actors and departments whose work affects the implementation of CFP and the state of fisher communities and fisheries resources. Advisory Councils by default represent both, nature conservation advocates and the fisheries sector and their role should be recognised as overarching.

Response: Eklipse has always welcomed broad participation in participatory events. Participants were drawn from a range of sectors, including academia, consultancy, NGOs, industry, and policymaking, using the Eklipse network and established Eklipse methods for expert consultation. This was complemented by targeted recruitment from 15 institutions initially identified as holding relevant expertise (see Annexe 5). Additionally, members of the EWG actively contributed by recommending external experts identified through the reviewed literature. Further participants were identified through consultation with organisations involved in related but independently conducted reports, such as the International Council for the Exploration of the Sea (ICES), the European Environment Agency (EEA), and IFREMER.

Comment: While the PelAC understands that there have been occasions for stakeholder involvement in this project with additional opportunities over the next couple of months, calls for involvement were not strategically directed at the ACs which are representative and legitimate EU fisheries stakeholder bodies and legally recognised as organisations pursuing an aim of general European interest. Therefore, the PelAC calls on DG ENV to recognise the Advisory Councils as strategic stakeholder bodies and increase direct communication regarding relevant work carried out in the marine space.

Response: This will be communicated to DG-ENV, but please be aware that Eklipse has been sending open calls for contributions to the community and through its widespread network, and has done its best to ensure stakeholder diversity and representation during the participatory workshop.

Replies to the pre-review process

1. Do the conclusions address the question of the request and are the conclusions supported by the results presented in the report?

Reviewer x1: yes, but might be good for each part to include clear recommendations for research and policy

RESPONSE: Thank you, we have considered your suggestion. While it has much value, this will be a fundamental deviation from the report structure that was requested. Therefore we remained within our previously agreed structure of the report and have added policy recommendations only as outcomes from the discussions on the participatory workshop which can be found in the report.

Reviewer x2: yes

Reviewer x3: *no comment*

Reviewer x4: Line 19 of conclusion: change "mandae" to "mandate". The conclusion does address the request.

RESPONSE: Thank you for spotting the typo and the positive feedback.

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Yes, they do address the questions of the request.

RESPONSE: Thank you.

Reviewer x11: *no comment*

Reviewer x12: yes, the report and conclusions address the request adequately. The conclusions are supported by the results. However, I have some doubts on how available literature / knowledge is actually translated into the results. I will provide more detailed comments later.

RESPONSE: Noted. We will respond to the second point where specific comments are raised.

Reviewer x13: no

RESPONSE: Thank you for your comment. We have included the suggestions of the other reviewers and hope that these inclusions also covered your concerns.

Reviewer x14: Yes I think so. There is a lot of material in the grey literature that would be good. But this is acknowledged in the limitations of the report. Given the amount of material covered by the report I think this is completely understandable.

RESPONSE: Thank you, we agree. For this reason, a lot of emphasis was placed on highlighting the limitations of the scoping.

Reviewer x15: Conclusions read in many passages more like recommendations. As written in other parts of this review, this report would benefit from a clear separation between limitations, knowledge gaps, recommendations and conclusions.

RESPONSE: Thank you, we removed the sentence in the conclusion referring to grey literature, and added a sentence about the choice of literature chosen in the Methods section describing the scoping review as follows: "The grey literature was excluded from the search because of the proposed time frame, and to focus on the peer reviewed scientific knowledge of effects and impacts." (Page 29)

Reviewer x16: *no comment*

Reviewer x17: Yes

RESPONSE: Thank you

Reviewer x18: The conclusion highlights the substantial knowledge gaps and geographical limitations, as well as the need for monitoring and standards to assess cumulative impacts, which are relevant to the MSFD. The conclusion also highlights the need to verify the potential impacts on multiple taxa, but I missed a brief mention of what and how to estimate them; for example, there is increasing understanding that functional traits and diversity are important strategies to estimate ecological impacts, beyond taxonomic-related indices. Functional traits are more universal measures and would allow cross-basin comparisons in EU waters and beyond. This topic is briefly mentioned on page 49 but is neither explored further nor mentioned in the conclusion. Overall, the conclusion is supported by the results described and targeted to the report's aims.

RESPONSE: Thank you very much for your suggestion, we added two sentences about this important point:

"In addition to taxonomic-based approaches, incorporating functional traits and diversity into impact assessments provides a more universal and comparable framework for evaluating ecological consequences across regions. Future monitoring and analysis should prioritise the collection of functional trait data, enabling cross-basin comparisons and a more robust estimation of cumulative impacts on ecosystem functioning."

Reviewer x19: Yes

RESPONSE: Thank you

Reviewer x20: Yes, I thought the conclusions and recommendations effectively addressed the mandate of the report, and accurately reflect the distribution of evidence revealed in the review, as well as the insights from the expert consultation workshop.

RESPONSE: Thank you

2. Does the discussion address the question of the request and is the discussion supported by the results presented in the report?

Reviewer x1: yes

RESPONSE: Thank you

Reviewer x2: yes

RESPONSE: Thank you

Reviewer x3: *no comment*

Reviewer x4: Yes but I still see a lack of recent papers and findings that I had indicated in the workshop. This is rather frustrating. However, the discussion does the job.

RESPONSE: Thank you for your response. The literature indicated in the workshop are referenced and can be found as part of the inputs provided by participants in the Workshop summary findings as well as Annexe 8 of the report. However, it wasn't the aim of the workshop to inject new papers into the Short Science summaries. This would require substantial work: from screening, to data extraction, and narrative synthesis.

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Yes, they appropriately address the questions of the request.

RESPONSE: Thank you

Reviewer x11: *no comment*

Reviewer x12: Yes, but see above

RESPONSE: Thank you

Reviewer x13: *no comment*

Reviewer x14: It is there but I think the discussion could be restructured a little to follow the same order as the objectives at the beginning of the report.

RESPONSE: Thank you. Our objectives were:

a. Investigate the impacts of fixed-foundation wind turbines and grid connection infrastructure expansion on each of the 11 Descriptors of GES under the MSFD (Figure 1), as described in https://environment.ec.europa.eu/topics/marine-environment_en, throughout the life-cycle[1] of a wind farm.

b. Assess the consequences of the cumulative impacts on marine ecosystems

c. Identify and analyse knowledge gaps through literature review, expert consultation and participatory workshop.

We decided not to summarize the results from the SSS because SSS are already short summaries, but we focused on points b) and c) in the discussion. Therefore, we feel that the structure of the discussion follows well the objectives enunciated in the introduction

Reviewer x15: Yes they do, but while being a strong, and to my knowledge unique, collection of data, with the immense effort of the authors clearly having led to a useful product, the product could benefit immensely from sorting it a bit more. Bundle, but keep clearly separated: Limitations, knowledge gaps and future recommendations for each Descriptor and make a separate cross-descriptor interaction chapter and a summary (instead of "discussion" which sounds journal publication- like, but this is a different format). Discussion would better be integrated into Descriptor chapters. I do not see the use of presenting results from the scoping review and the workshop in separate chapters. I'd suggest extracting the "links" between Descriptors from the individual Descriptor chapters and preparing one collective links depiction that can be linked to the suggested better graphical abstract. This should not only depict links and what to be observed/monitored, but also what has been observed, in short, and how the phenomenon influences achievement of GES in different descriptors.

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[1] The life-cycle of a wind farm considers initial surveys (planning phase), construction, operation and decommissioning.

RESPONSE: Thank you for your feedback and suggestions to the discussion. Following our methodology and with the objective of keeping the clarity of the results from the scoping review, as well as the balance between clusters and input from participants during the workshop, the decision to have these results separated was taken. Moreover, considering the timeline of the request and that the SSS already contain more specific information regarding knowledge gaps and cumulative impacts, the discussion aims to give a wider perspective on the review and the overarching results presented in the report.

Reviewer x16: *no comment*

Reviewer x17: Yes

RESPONSE: Thank you

Reviewer x18: Yes, the discussion section has focused on the cumulative effects, impacts related to development, and cascading effects of OWFs, in addition to the limitations, aligning well with the results section.

RESPONSE: Thank you

Reviewer x19: Yes

RESPONSE: Thank you

Reviewer x20: Yes, I thought the discussion was very well written and accurately presented the main findings, while also noting the important nuances when interpreting these results, for example highlighting important knowledge gaps and limitations.

RESPONSE: thank you

3. Does the Short Scientific Summaries represent a comprehensive evidence synthesis under the topic of the impacts of offshore wind farm expansion? If not please provide further information.

Reviewer x1: yes

Reviewer x2: yes

Reviewer x3: *no comment*

Reviewer x4: Yes good initiative

Reviewer x5: *no comment*

Reviewer x6: no, Point 1 of summary states: “The construction of the OWFs causing the displacement of various species populations, disturbances to the benthic sessile fauna and marine mammals and fish reacting negatively to underwater noise” Point 1 of summary states: “(D11): Impulsive noise generated during installation was found to potentially harm marine mammals, although the main focus was on a single species, the harbour porpoise. Some behavioural changes in fish were also identified, but evidence was limited and highly variable at individual level. No effects were demonstrated on marine mammals in relation to continuous noise generated by the operational wind turbines while some fish appear to be attracted to the turbines. It cannot be established whether the attraction is related to prey availability or a reaction to the sound.” These two points are not coherent and while in Point 1 is suggested a clear disturbance on mammals and fishes because of the underwater sounds, in point 11 is stated that there are no negative effects reported on mammals and fishes during OWFs.

Point 1 states: “The construction of the OWFs causing the displacement of various species populations, disturbances to the benthic sessile fauna and marine mammals and fish reacting negatively to underwater noise” Point 6 states:

“(D6): OWFs impact macrobenthic communities in the sea floor through colonisation and increased productivity, but also lead to habitat loss, shifts in species dominance, and the spread of non-native species. These changes can cause cascading effects across trophic levels. The ecological impact of related management measures, like bottom-trawling bans, remains unclear in the short term. Significant knowledge gaps persist regarding long-term and broader-scale seabed impacts, as well as effects across different stages of OWF development, including decommissioning” The ecological effects of bottom trawling ban measures, should be well documented in several scientific publications even if the studies are not carried out within OWF plants. The habitat loss should be better introduced and explained. We should discuss a shift of habitat instead of a loss of habitat. The “disturbances to the benthic sessile fauna” should be contextualised considering the percentage of the disturbed surfaces over the original habitat extent.

RESPONSE: Thank you for your comment. Due to the methodology applied, not all papers relevant to specific pressure descriptors, such as D11, were screened in other descriptors. As such, the findings are limited to the literature that was screened for each short summary. This leads to some differences in conclusions of specific SSS. Regarding D6: Following the selection criteria for the literature used in the scoping review, one of the inclusion criteria is that the study assesses impacts inside OWFs (please see eligibility criteria and screening process sections of the Methods protocol), therefore, studies assessing the effects of bottom trawling ban measures outside OWFs were not included in the literature. Regarding the definition of the term “habitat loss”, physical loss and physical disturbance have been further clarified, as defined by the MSFD criteria for D6 where physical loss refers to a permanent change of the natural seabed. Following this definition, the introduction of permanent hard structures on soft-bottom habitats can induce a permanent change of the natural seabed. Habitats *shifts are also reflected in D6 for changes in distribution and dominance of species, for example (see page 63-2) and disturbances are now contextualized to the nature of the studies.*

Reviewer x7: Yes, but pay attention to the citations. In pages 24 and 25 (seabirds), you include many citations, but without the year (or the numbering, as in other parts), but check all since in dolphins also occurs

RESPONSE: We thank the reviewer for raising this point. We have included years.

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Yes, the short scientific summaries represent a comprehensive evidence synthesis under each topic of the impacts of the offshore wind farm expansion.

RESPONSE: Thank you.

Reviewer x11: *no comment*

Reviewer x12: Not sure. I do have some comments on the short scientific summaries - as listed in the executive summary. page 1, line 34: the effect of noise is mainly related to the construction phase. I don’t have real evidence of fish reacting negatively to noise, and it seems as with time, at least seals are increasingly observed in OWFs, hence getting used to the noise?

RESPONSE: For detailed effects of noise, one should refer to D11. As highlighted there, there is no clear evidence that fish react negatively to noise during construction from the available literature; but there are individual responses of fish that are reported in the literature. Also note that the literature only considered wind farm-related evidence. There may be literature supporting a negative response of fish to noise from other anthropogenic sources. We have not reviewed evidence mentioning seals being increasingly observed in the wind farms; I suspect that may be related to prey availability and lack of fishing as well as potential for haul-out.

Page 2, item on food webs: there are a lot of species present in OWFs, in high densities. As such, the idea that noise is disruptive probably needs to be reconsidered.

RESPONSE: For detailed effects to noise, the short summary on D11 should be referred to. However, we agree that the presence of high densities of species in OWFs suggests a need to reconsider the assumption that noise is universally disruptive. We will avoid making absolute statements and instead, we will emphasize that the effects of noise might be species- or context-dependent and that further research is needed to understand these dynamics.

Page 2, item 6. Did the authors consider the altered sea floor functioning, mentioned in papers by Coates et al, Ivanov et al and De Borger et al, showing accumulation of organic matter within OWFS (merely close to turbines)? Seems closely related to D6 as integrity includes functioning. Page 2, item 7. I miss the effect of the blades on stratification of the water column. See papers by the research group of Ute Daewel. Page 3, Item 11: seems contradictory to earlier messages where noise is generally reported as an important pressure.

RESPONSE: Thank you for your comment. Response of specific noise-sensitive species (e.g. harbour porpoise) to noise emissions from offshore wind farm life cycle stages or activities has been reported.However, we acknowledge the existing knowledge gaps regarding other types of reactions, specially from taxonomic groups apart from marine mammals. Regarding Page 2, item 6. Effects of organic matter on the seafloor are further mentioned in SSS D6 (page 58)

Reviewer x13: *no comment*

Reviewer x14: Yes, as far as I am aware these are comprehensive

RESPONSE: Thank you

Reviewer x15: I would like to see a concluding sentence in the end of each bird group under D1, i.e. page 24 after line 27, page 25 after line 4, and so forth. The same for the mammal group paragraphs, page 26, line 41, and so forth, and after the paragraph for fish, page 28, line 23.

RESPONSE: We thank the reviewer for this comment. However, we feel that a concluding sentence per biodiversity compartment would not necessarily hold added value. Concluding remarks can be found under "Identified knowledge gaps" and "conclusions".

Mostly, chapter D3 unfinished, as mentioned before. Page 41, line 4: "New economic opportunities—Some fishers may benefit from alternative income sources, such as providing services for wind farm construction, maintenance, or scientific monitoring.» Please describe evidence for fishermen taking such opportunities. Otherwise, this is an opinion of the author.

In general, the whole chapter on D3 seems unfinished, reads as if headlines are provided but lack the substance, i.e. explanations. As an example: Page 41 line 8: "Conflicts between stakeholders—Tensions between fishers, planning authorities, wind energy developers, and policymakers, tourism over space use, access rights, and compensation (56). Here a headline and a reference are combined, without explaining what these tensions, might consist of. This is in stark contrast to D1, where the content in the literature is sorted and discussed in more detail.

Page 42, Identified knowledge gaps: Some of those come with recommendations others not. Please harmonize between Descriptor chapters and make clear which is which, maybe as a table? Line 20: "Insufficient experimental research (only 1% of studies), limiting causal understanding." Please suggest what such experimental studies should look like?

Page 42, line 35/36: "interactions with other marine activities (e.g. fisheries, climate change)» please review this sentence, as this chapter is about commercial fish, i.e. fisheries, and therefore the "other" in relation with "fisheries" is not logical.

Page 56, "Foundation installations are predicted to decrease phytoplankton abundance within 2 days of their installation in the vicinity of selected OWFs in regions categorised as non-problematic, potentially problematic and problematic eutrophication status. Turbine installations are predicted to increase phytoplankton abundance after 30 days only in regions with non-problematic eutrophication status (67).» should also be summarized under cumulative effects.

Page 57: Can we now expect more or less eutrophication from OWFs, and what are the determining factors?

Page 68, line 20: “These hydrodynamic shifts significantly increase dredging costs, undermine coastal protection measures, and disrupt organisms’ habitat connectivity.” Please present references and describe how coastal protection measures are undermined, I would think erosion would rather be prevented by less waves?, also line 25: “when sea level rise impairs OWF-induced wave attenuation» does this imply the wave attenuation is intended? Also, OWF would counteract the climate change effects, where is the synergy? This confuses me. Please make it clear.

Page 69, line 13 “and revolutionary linkages” – revolutionary? This comes out of the blue, what is meant by this and how does it relate to the previous text it should be a conclusion on?

Page 74, line 18: “Cumulative effects” seems to be misinterpreted as links to descriptors here. Cumulative effects and links to descriptors should be treated separately. Also potential links with microplastics (D10) from paint and coating and painting abrasion from OWFs must be included. These do contain chemical contaminants, as mentioned in knowledge gaps.

Page 74, line 28: Alternative to sacrificial anodes, such as “impressed current cathodic protection system (ICCP)”, should be considered and tested for difference in impact. These systems would have much lower release of metals.

Descriptor 10 discussion completely omits the question about pollution from abrasion of paints, coating and rotor blades, which are of high public interest. This needs to be included.

In general, recommendations for reporting criteria for harmonization and longevity of the data (example D11 page 88, line 40), and data sharing strategies could be beneficial, maybe in an overarching chapter.

All Descriptor chapters and maybe overarching summary: The knowledge gaps should be carefully crafted to actually represent knowledge gaps. Some describe what has been done, instead of the gap (e.g. Page 64 line 14), some are recommendations. Pinpointing knowledge gaps and recommendations separately in a harmonized format across all descriptors, for example as a table, in a concise way would lift the applicability of this product immensely. Maybe limitations of existing studies, as done in D11, could be added as well.

RESPONSE: Thank you for your comments. In response to the comment about page 56, the comment has been addressed. In response to the question about page 57, we are unable to predict if there will be more or less eutrophication from OWFs and potential determining factors based on the data extracted from the screened articles. To address this question, a computational modelling study will need to be conducted which is outside the scope of this report. In response to the comments about page 74 line 18, these comments have been addressed. In response to the comment about page 74 line 28, thank you for sharing this information about the “impressed current cathodic protection system which has now been mentioned.

Reviewer x16: *no comment*

Reviewer x17: Yes

RESPONSE: Thank you

Reviewer x18: Yes, the summaries do a good job with the existing information and scope and limitations (e.g. exclusion of grey literature).

RESPONSE: Thank you.

Reviewer x19: Yes - These were my favourite part of the report :)

RESPONSE: Thank you.

Reviewer x20: Yes, I thought the SSS section was concise yet comprehensive in synthesizing the main results from the evidence synthesis and expert consultation.

RESPONSE: Thank you

4. Are appropriate and up-to-date peer-reviewed references used in the report? Do you know of any additional references, or examples which the report should mention (please be as precise as possible and provide references)?

Reviewer x1: yes, but this would be a relevant one for contamination section:

Zonderman, A., Wippermann, D., Ebeling, A., Klein, O., Erbslöh, H.B., Zimmermann, T., Hildebrandt, L., Hasenbein, S., Weinberg, I., Kirchgeorg, T. and Pröfrock, D., 2025. Analyzing the metal body burden of turbine-colonizing mussels from North Sea offshore wind farms. Marine Pollution Bulletin, 218, p.118216.

RESPONSE: Thank you for suggesting a recent article published in May 2025. The keywords used in the search strategy for articles for the scoping review, as detailed in Annexe 3 were subjected to a comprehensive review process and were deemed appropriate and validated by external reviewers.

Reviewer x2: yes

RESPONSE: Thank you for your comment.

Reviewer x3: *no comment*

Reviewer x4: https://www.health.belgium.be/en/eden2000-full-report

RESPONSE: Thank you for your comment. However, this would constitute grey literature. Grey literature is excluded as noted in the report.

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Yes, peer reviewed journal publications, and reports have been referenced in the report.

RESPONSE: Thank you for your comment.

Reviewer x11: *no comment*

Reviewer x12: yes, see above and elsewhere in this report.

RESPONSE: Thank you for your comment.

Reviewer x13: *no comment*

Reviewer x14: Yes, there was nothing obvious that I thought was missing. Although I was surprised there was not more material on turtles.

RESPONSE: Thank you for your comment. The keywords used in the search strategy for the scoping review included turtles (please see Annexe 3).

Reviewer x15: Yes, references mostly appropriate. Page 10-12: Mural platform should be referenced and/or described. Some lacking in D3, see question 1. Line 29: “Studies show competition for fish stocks.” Too general, specify and reference. Page 41, line 3: “while others may decline, leading to unpredictable impacts on fisheries yields” lacks reference

RESPONSE: Thank you for your comment. Mural is a visual collaborative platform and how the platform was used during the participatory workshop is clearly described in the report (please see page 14). Since it was used as a tool to facilitate the workshop, it can’t be referenced. However, we have provided a footnote with a hyperlink to the mural web site https://www.mural.co/. Comments on D3 are addressed further down in the respective paper - claims in line 29 and 41, line 3 have been substantiated with references and examples, where possible.

Reviewer x16:

Reviewer x17: Yes. No additional references within the scope required.

RESPONSE: Thank you for your comment.

Reviewer x18: Yes, references are appropriate, but it is a pity grey literature could not have been included due to time limitations - although the conclusions would likely have been similar. Other sources could have been mentioned, but I highlight the recently published ICES document “EU request on economic, social, and ecological impacts of offshore wind farms (OWFs) and floating offshore wind farms (FLOWs) on fisheries in the Baltic Sea, Celtic Seas, and Greater North Sea.” The report is new and, for obvious reasons, was not yet included, but could perhaps be mentioned in a new version. Several points raised in the ICES report requested by the EU align with the points raised here, and are sometimes complementary.

ICES. 2025. EU request on economic, social, and ecological impacts of offshore wind farms (OWFs) and floating offshore wind farms (FLOWs) on fisheries in the Baltic Sea, Celtic Seas, and Greater North Sea. In Report of the ICES Advisory Committee, 2025.

Another relevant document is the in press report from NIVA on “The potential of offshore wind farms to spread marine alien species”, which includes relevant information for the NIS section and ANS (85). Document can be sent if you consider it relevant.

RESPONSE: Thank you for your comment and suggested documents. However, the suggested documents would constitute grey literature and grey literature is excluded as noted in the report.

Reviewer x19: Yes, but I am not following the relevant literature closely. Here is one additional paper that could be considered: https://www.sciencedirect.com/science/article/pii/S0964569124000085?via%3Dihub

RESPONSE: Thank you for your suggested article. The keywords used in the search strategy for papers for the scoping review, as detailed in Annexe 3 were subjected to a comprehensive review process and were deemed appropriate and validated by external reviewers.

Reviewer x20: Yes, I thought the methodology for searching and screening for literature was very comprehensive given the scope of the review, and I do not have any additional references to suggest.

RESPONSE: Thank you for your comment.

5. Are the figures appropriate and helpful? What improvements would you suggest; e.g. is the number of figures helpful or should some be removed; are the figures supported by appropriate text?

Reviewer x1: yes, but maybe link the papers finally selected in each review to the ones in the list by reference number. Enables rapid cross checking

RESPONSE: We thank the reviewer for this useful suggestion. We have decided to develop a reference section per descriptor to enable rapid cross-checking

Reviewer x2: yes

RESPONSE: Thank you

Reviewer x3: *no comment*

Reviewer x4: figures are informative but not eye appealing - I would spend some time to improve the tick marks alignment, the size of the characters and the alignment between panels. Colour blind friendly colours (i.., viridis palette) should be used…

RESPONSE: We thank the reviewer for the insightful comment. We have tried our best to apply color-blind friendly palettes to provide more visually aiding graphs for all. We hope that contrasts are interpretable at the least. All figures for SSS have been re-done.

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: Yes, but pay attention in some cases to have captions able to make them self-reading (e.g. there are some with abbreviations not explained)

RESPONSE: We thank the reviewer for the useful remarks. All captions have been reviewed and better formulated in order for figures to be self-reading.

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Yes, figures shown are appropriate.

RESPONSE: Thank you

Reviewer x11: *no comment*

Reviewer x12: the figures are appropriate and helpful

RESPONSE: Thank you

Reviewer x13: *no comment*

Reviewer x14: Yes. They largely explained the methodology used rather than the results of the review. But I can't think of any additional figures I would include.

RESPONSE: Thank you

Reviewer x15: Geographical distribution maps are interesting. A lot of figures are about metrics, especially in D1, very few about the results or conclusions. Not sure if those metrics figures are of such interest to be in the main text. I would find the annex more suitable for most of them. I would prefer figures illustrating results. Convert Table 1 to a graphical depiction, of the inter-linkages in the form of a diagram, not a list, and direction of influences shown as arrows? In Figure 2 it is a little confusing that the "no/exclude" points towards the full text screening.

RESPONSE: We thank the reviewer for this useful feedback. Table 1 cannot be changed to a graphical depiction. We think this would complicate an already complex subject. Figure 2 has been improved for clarity purposes.

Reviewer x16: *no comment*

Reviewer x17: Typically the figures are good. There are inconsistencies in some formatting and issues with text legibility at times. Sometimes, figures are not referred to in the text.

RESPONSE: We thank the reviewer for this comment. All figures have been revised, including captions. Clarification has been improved.

Reviewer x18: Figures are appropriate and well made, but the report is long, and if there is a need to shorten it and improve readability, I would suggest moving the PRISMA diagrams and the map of paper distribution in the EU to the supplementary material.

RESPONSE: Thank you for this constructive comment. As a scoping review is used for informing what literature is available in a qualitative and narrative way, we believe the metrics summarised form important results. Thus, we choose to keep them in the main text. Likewise for the screening process, we believe this provides interesting transparent information the reader can easily interpret.

Reviewer x19: Yes. I only found Fig. 4 and 5 hard to read, and not sure how much they add to the report - maybe they could be omitted?

RESPONSE: We thank the reviewer for this remark. We are unfortunately unable to provide better images. We have enlarged them. However, the main reason for their inclusion is to provide an example of the working process.

Reviewer x20: Yes I thought the figures in the report were one of its best features, and helped the reader understand the distribution of evidence as well as how different metadata categories were inter-related to reveal knowledge gaps.

RESPONSE: Thank you

6. Are the tables appropriate and helpful? What improvements would you suggest? E.g. are the main findings supported by the results included in the report.

Reviewer x1: yes

RESPONSE: Thank you

Reviewer x2: yes

RESPONSE: Thank you

Reviewer x3: *no comment*

Reviewer x4: ALL GOOD

RESPONSE: Thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: Yes, but pay attention in some cases to have captions able to make them self-reading (e.g. there are some with abbreviations not explained)

RESPONSE: We thank the reviewer for this comment. All figures have been revised, including captions. Clarification has been improved.

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Yes, they are helpful. More detailed tables could be utilized to show the damage to marine life, or improvement to marine life due to the wind farm introduction / expansion could allow readers to better understand the impact.

RESPONSE: We thank the reviewer for this comment. Due to resource limitations we have provided the maximum. In addition, all figures and tables have been revised, including captions. At least, clarification has been improved.

Reviewer x11: *no comment*

Reviewer x12: the tables are appropriate and helpful

RESPONSE: thank you

Reviewer x13: *no comment*

Reviewer x14: Yes, no issues here. Table 1 could do with better formatting.

RESPONSE: We thank the reviewer for this comment. But table 1 will remain.

Reviewer x15: I would value tables summarizing the findings, maybe structured into empiric and modeling data, maybe data quality indicators and the conclusions from that. Tables with knowledge gaps and recommendations. I doubt the helpfulness of Table 1 – what is the classification intended to help with? Maybe a graphical depiction, of the inter-linkages in the form of a diagram, not a list, and direction of influences shown as arrows could be more helpful.

RESPONSE: We thank the reviewer for the comment. We have structured figures into modelling and empirical data. And have adjusted some sections of the findings accordingly. We believe that narratively synthesizing knowledge gaps largely suffices, which is common practice for scoping reviews .

Reviewer x16: *no comment*

Reviewer x17: These are typically helpful. Some figure captions lack basic details.

RESPONSE: We thank the reviewer for this comment. All figures have been revised, including captions. Clarification has been improved.

Reviewer x18: Tables are appropriate and easy to understand.

RESPONSE: Thank you

Reviewer x19: Yes

RESPONSE: Thank you

Reviewer x20: Yes, although perhaps Table 4 on the number of studies could be presented as a map?

RESPONSE: We thank the reviewer for this useful insight. We have produced maps in accordance with the above suggestion. The maps were developed for each descriptor

Is the text and writing style easy to follow and understand (i.e. self-explanatory, free of jargon)? If not, where do you see a need for language revision, or more clarity? Please indicate any suggestions in the sections concerned with the page and line numbers.

Reviewer x1: yes

RESPONSE: thank you

Reviewer x2: no - more clarity and lower reading age needed

RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x3: *no comment*

Reviewer x4: reads well

RESPONSE: thank you

Reviewer x5: Yes, the text style is at the right level, and can be understood by scientists, OWF operators, decision makers and general public, provided that they have previous knowledge of the subject

RESPONSE: thank you

Reviewer x6: *no comment*

Reviewer x7: in general, yes

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Yes, the writing style is easy to follow and understand, all jargons have been explained in the report.

RESPONSE: thank you

Reviewer x11: *no comment*

Reviewer x12: all is fine except that it is rather annoying that years are not mentioned in the ref list. Several of the mentioned authors wrote multiple papers/reports, it makes sense to make clear which one is referred to.

RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x13: *no comment*

Reviewer x14: Overall very good. I have a few specific comments later.

RESPONSE: thank you

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: Apart from some issues that should be addressed after the review (e.g. spelling mistakes, sentences needing editing, inconsistencies in how references are cited in text), the report reads well and is easy to follow.

RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x18: Yes, the language is clear and free of jargon.

RESPONSE: thank you

Reviewer x19: I think this is a very good report. Congrats to everyone involved! If I had to think of one potential 'weakness' is that it might be considered a bit too lengthy. You could consider moving some content to annexes (e.g. parts of the Methods) or shorten others (e.g. the 'Workshop summary of findings' and the 'Discussion'). But if the requester is happy with this length, all fine!

RESPONSE: Thank you for your comment. This aspect will be considered in the final version of the report

Reviewer x20: *no comment*

Specific comments on the report, section by section

Title (Cover page)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: reads well

RESPONSE: Thank you

Reviewer x5: “consequences on achieving GES…” , rather than “consequences for achieving Good Environmental Status” ?

RESPONSE: Many thanks for your comment. The group has decided that the right framing is for achieving… since it indicates the purpose or reason for achieving the Good environmental status and not "on achieving," which signifies that the action is completed or realised

Reviewer x6: *no comment*

Reviewer x7: Yes, it is adequate. However, in the second page, suggest a citation format

RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Comment: The title is clear, policy-relevant, and specifies the topic well. However, it is lengthy and could benefit from restructuring.

Suggestion: Consider simplifying the phrasing for readability: e.g., “Cumulative Environmental Impacts of Offshore Wind Expansion on EU Marine Waters”.

RESPONSE: RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: Title is fine. The picture is standard. Can’t help thinking that a graphic to show link to MSFD descriptors would be good on the front cover.

RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x15: I’m concerned about the subtitle semantics, which I think are wrong. It reads “What are the consequences for achieving GES…”, but consequences are “of” something, not “for” something, and just exchanging “for” with of” will not suffice as the report does not describe the good effects on the environment if GES is reached, but examines the multi-level impacts of the planned expansion of wind energy production at sea, or in other words describes the impacts (including cumulative) of the expansion of offshore wind energy 6 production on the achievement of the good ecological status (GES).

RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: Shouldn't the title have a bigger font size than the 'Knowledge synthesis report'?

RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x20: *no comment*

Glossary

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you for your comment.

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: It is adequate. However, as it includes many abbreviations, I suggest to include first the abbreviations section

RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Pages 9–12

Comment: Comprehensive and informative, but a few definitions (e.g., "Ecosystem efficiency", "Scenario Modelling") are vague or could benefit from examples.

Suggestion: On p.10, lines 21–24, "Ecosystem efficiency" could clarify by mentioning real-world metrics (e.g., changes in fish biomass or productivity ratios).

RESPONSE: Thank you for your valuable comments. We have incorporated the recommended improvements to enhance this section.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: Good.

RESPONSE: thank you

Reviewer x15: I'm reluctant about the use of capital letters in random expressions, such as Participatory Workshop and Policy-relevant Knowledge, and about not using it in the explanation of all-capital letter abbreviations such as Predicted no effect Concentration (PNEC).

RESPONSE: Thank you for your valuable comment. We have taken your suggestions into consideration and adjusted the text accordingly.

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Abbreviations

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: check that all are included

RESPONSE: Thank you for your comment. This aspects will be included in the final version of the report

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10:

Page 13

Comment: Well-organized and helpful.

Suggestion: Include some abbreviations referenced frequently in charts and figures, such as "SSB" and "SPM," directly within relevant sections too.

RESPONSE: Thank you for your comment. This aspect will be solved in the final version of the report

Reviewer x11: *no comment*

Reviewer x12: no comments

RESPONSE: thank you

Reviewer x13: *no comment*

Reviewer x14: Good to have. Personally, I would prefer to see as few acronyms as possible and make it easier on the reader. “after only??”. I would spell-out BA, CI, EWG, KCB, MEG, SR and SSS rather than use acronyms. They aren’t in common usage and occur so in-frequently I don’t see the point of using acronyms.

RESPONSE: We have produced a glossary to help the reader navigate the acronyms at the start of the report. We have used acronyms when the term is used on multiple occasions in the report in line with established good practice. *[Response here]*

Reviewer x15: Good

RESPONSE: Thank you

Reviewer x16: *no comment*

Reviewer x17: No header row given. It took me a moment to realise that the first abbreviation and description were not titles for the columns.

RESPONSE: Thank you for your comment. We have taken your suggestions into consideration and adjusted the text accordingly.

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Executive summary (page 1)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: maybe you need to explain all abbreviations the first time they appear. You have included some, but not all e.g. Marine Strategy Framework Directive has not (MSFD) after

RESPONSE: Thank you for your comment. This comment has been addressed.

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Pages 15–17 (Lines 1–42)

Clarity: Generally well-written but some sentences are too dense.

Example: Line 12–22 is an overly long bullet—consider breaking it into two or more.

Substance: Adequately highlights key takeaways.

Suggestion: On p.15, line 30, explicitly mention that SSS means “Short Scientific Summaries” to aid standalone readability.

RESPONSE: Thank you for your comments. There are three bullet points in the lines stated in your comments. Please note that the three bullet points are the aims of the report. Breaking them into more bullet points has implications for the aims of the report and as a result, this was not considered. It is unclear what is meant by ‘adequately highlight key takeaways’. In response to the suggestion about SSS, this has been included.

Reviewer x11: I find it relevant to mention in the Executive Summary or Introduction that this policy request was originally submitted by DG ENV to the EC Knowledge Centre for Biodiversity (KCBD) through the KCBD ticketing system in December 2023. The request was then forwarded by KCBD to BioAgora, and subsequently from BioAgora to EKLIPSE.

RESPONSE: Thank you for your comment. This has been addressed.

Reviewer x12: no comments

RESPONSE: thank you

Reviewer x13: *no comment*

Reviewer x14: No issues

RESPONSE: thank you

Reviewer x15: Good

RESPONSE: thank you

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK - If keeping the term ‘strongly’ (line 35), just make sure to reinforce that ’Fixed-turbine OWF…”

RESPONSE: Thank you for your comment. The sentence has been amended to include fixed turbines.

Reviewer x19: Please mention in the beginning that this ENV request came through the KCBD ticketing system. Also, in the text summarizing the results by Descriptor, I find that Descriptors where the positive and negative effects are clearly outlined (e.g. D1, D4) are more informative than the ones that have an overall ‘neutral’ tone by using verbs like ‘influence’ or ‘impact’ (e.g. D3, D5)

RESPONSE:Thank you for your comment and observation. Reference has been made to the ENV request and the KCBD ticketing system at the start of the executive summary. Please note that concise summaries of the findings are presented in the executive summary to provide an overview, with more information on each descriptor presented within the report.

Reviewer x20: *no comment*

Introduction (page 4)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE:

Thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: In general is adequate. However, I disagree a bit with Table 1. The descriptors are mainly assigned to pressures and state; however, there are some criteria, within each descriptor, which can be assigned to other parts of the DPSIR (see the MSFD guidance from 2022) e.g. bycatch in D1 is impact; in D2 D2C3 can be state/impact; D3 is not pressure/state, D3C1 (mortality) is impact and the other two criteria are state; D5 is not pressure/state, since the first criterion is pressure and the remainder impacts; D6 is correct, but D6C3 is impact; D7, D8 and D10 are pressures and impacts

RESPONSE:

Thank you for your valuable insights. We have reflected on the DPSIR framework, and while we agree that some criteria could be assigned to the DPSIR, which is mainly used for analysing and managing environmental and socio-economic systems, this would extend the scope of this report, but should be considered in future assessments and monitoring programmes.

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Page 18

Strengths: Provides context and policy relevance effectively.

Critique: Lines 6–10 reference the "EU Horizon Europe BioAgora project," but more context on its framework would aid readers unfamiliar with it.

Suggestion: Briefly mention how BioAgora links knowledge to EU environmental governance goals.

RESPONSE:

Yes, thank you for pointing that out, we have added a short introductory paragraph on how this request was received via the EC-KCBD ticketing system and why it became an Eklipse request and subsequently an Eklipse Process. And have added references & links to the BioAgora project. However, we did not add an extra paragraph to the text to avoid shifting the focus of the report towards SPIs.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: No issues

RESPONSE: thank you

Reviewer x15: Good

RESPONSE: thank you

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: Lines 1-9 contain statements that could be supported by references

RESPONSE: the text describes the request received and sets a general context. Where specific references are needed they are mentioned in the relevant parts of the introduction.

Background and objectives (pages 4- 8)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: Good that the report focuses on cumulative impacts, that are still a missing output in many studies, including ESS and EIA, but also scientific studies,and that cascading impacts are addresses

Wouldn't it make sense to add a short informative section (2 pages, mainly figures) recalling the main components of an OWF in order to introduce the technical aspects that are referred to later ? (e.g. monopile, gravity, jacket, cables…)

RESPONSE:

Thank you for the constructive feedback. We have reflected on your suggestion and added an infographic presenting the main components of an OWF in order to introduce the technical aspects that are referred to later.

Reviewer x6: *no comment*

Reviewer x7: OK

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Pages 4–8 (Corresponds to pages 18–22 in PDF)

Writing Quality: Clear and informative.

Suggestion (p.19, lines 18–22): Break the multi-part objective list into bullets for readability.

Comment (p.21, lines 4–21): Good inclusion of EU legal instruments. Consider linking this more directly to how OWFs influence each legislative framework in practice.

RESPONSE: Thank you for improving the readability of our report, we followed your suggestions where applicable

Reviewer x11: *no comment*

Reviewer x12: *no comment*

Reviewer x13: *no comment*

Reviewer x14: No issues

RESPONSE: thank you

Reviewer x15: Good

RESPONSE: thank you

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: P4. L.4: Please mention that this ENV request came through the KCBD ticketing system. You could also mention the date: December 2023

RESPONSE: Yes, thank you for pointing that out, we have added a short introductory paragraph on how this request was received via the EC-KCBD ticketing system and why it became an Eklipse request and subsequently an Eklipse Process.

P.4; L.13-15: What proportion of the total EU energy mix do those values represent?

RESPONSE: This is now mentioned in the first paragraph of the introduction as follows "This request is funded by the EU Horizon Europe project "Connecting biodiversity knowledge and decision-making" – BioAgora and it was received through the ticketing system of the Knowledge Centre for Biodiversity (https://knowledge4policy.ec.europa.eu/biodiversity_en) in December 2023."

Reviewer x20: *no comment*

Methods (pages 9-18)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: The choice to review only peer-reviewed publications is understandable, but it probably misses a lot of information. This sector is industry driven, and a lot of useful data and observations could be found in grey literature and environmental impact assessment studies.

RESPONSE: We thank the reviewer for this valuable comment. In our Scoping review, we limited our review to peer-reviewed publications for two main reasons: 1) to ensure consistency, transparency, and objectivity (fundamental *principles in research). Conversely, including grey literature (mostly industry-led initiatives) would have introduced challenges in terms of ensuring methodological objectivity; 2) Authors were also constrained by a short policy window that required such decisions in order to control the volume of literature. That said, we fully recognize this as a limitation and have improved the section on Limitations accordingly.*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Pages 9–18 (PDF pp. 23–32)

RESPONSE: Authors do not understand the comment.

Reviewer x11: *no comment*

Reviewer x12: no comment

Reviewer x13: *no comment*

Reviewer x14: pg 13-4: no action needed. Good to define groupings, but I'm not clear on why you choose these groupings rather than MSFD pressures. Using MSFD pressures would be easier to compare to other CIA studies and projects (well eventually anyway!) Overall, I like the screening approach and may borrow it for another project I'm working on - it's clear and easy to see how you did the work.

RESPONSE: We thank the reviewer for this positive comment.

Reviewer x15: In Figure 2 it is a little confusing that the "no/exclude" points towards the full text screening.

RESPONSE: We thank reviewer 15 for this remark. We have clarified Figure 2 (p. 11) accordingly. In order to improve readability and ensure no misunderstanding with regard to "no/exclude", we have modified the colours of textboxes. Equally, we chose to adjust the number of criteria illustrated to improve comprehension.

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: Some parts that are too detailed could be sent to annexes

RESPONSE: We thank the reviewer for this insight. We chose to include details in the methods to ensure transparency, which is common practice in evidence synthesis. The most detailed methods are compiled in the annexes.

Reviewer x20: Overall I thought the methods were well designed and written in a manner that was easy for a non-expert to understand.

RESPONSE: We thank the reviewer for this positive remark.

Methods - Stage 1: Scoping review for SSS (pages 10-12)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: p.11, l 15 : Setting characteristics : tidal regime and depth strongly influence some impacts

RESPONSE: The Setting characteristics from the PerSPEcTiF question framework requires recognising context (as setting, environment). In this respect, the corresponding setting or environmental context is that of the European seas. This objectively sets the perimeter for the selection criteria.

Reviewer x6: *no comment*

Reviewer x7: I commented this during the workshop. In my opinion, WoS and Scopus are quite limited. Google Scholar would broaden the findings of evidence, since many reports could be included. In addition, not sure if the evidence should be limited to Europe. Some of the effects will be the same elsewhere and this could be much better to make the results more robust

RESPONSE: We thank the reviewer for these insights. Firstly, we strongly disagree that Scopus and the Web of Science are limited. This is quite the opposite - they are the most recognised databases for covering the environmental sciences. Indeed, the total number of articles indexed in Scopus and Web of Science has grown exponentially in recent years (for example, see Hanson et al, 2024, *Quantitative Science Studies*). Web of Science indexes over 22,000 journals, books and conference proceedings, equating to over 95 million records. Scopus boasts similar figures. Google scholar, on the other hand, is not a database. It is a web-based search engine that uses web scraping techniques to retrieve published documentation (grey and academic) on the web. It can have advantages when searching grey literature (see Haddaway et al, 2015, Plos One), but it is no match for Web of Science or Scopus in terms of academic sources, secondly, concerning the comment on the "Europe" Scope. This decision was taken to align tightly with the MSFD, which is an EU-ratified directive.

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Stage 1: Scoping Review for SSS (Pages 10–12) Comment (p.24, lines 17–24): Excellent use of PerSPEcTiF framework and dual database strategy (WOSCC and Scopus). However, search string details being hidden in an annex limits replicability.

Suggestion: Include a sample search string inline for transparency.

RESPONSE: We thank the reviewer for this positive feedback. In line with other comments that suggest the Methods section is too detailed (cf Reviewer 19 above) we choose to keep search strings in annexes. We disagree that this hinders transparency. All search strings are referenced and easily accessible. We have, however, added precision in the table title referring readers to annex 3.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: N/A

Reviewer x15: Mural platform should be referenced and/or described.

RESPONSE: We have provided a footnote reference to the Mural website

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Methods - Stage 2: Participatory workshop using external experts (pages 13-16)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: p. 15 l 3 : D7 is usually linked to D1 and D6 (benthic habitats) and I expected to find it in cluster 2

RESPONSE: Thank you for your valuable input. This is a very good point, however, in order to distribute wisely the Expert Working Group (EWG) available participants and balance the cluster inputs in order to collect the feedback from all participants, a pragmatic decision was made to divide the groups in that way. Given that D1 (regarding benthic communities), D2 (non-indigenous species) and D5 (eutrophication) are also tightly connected to D6, we had to leave space for such discussions, allocating D7 in another cluster group.

Reviewer x6: *no comment*

Reviewer x7: nothing to comment

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10:

Stage 2: Participatory Workshop Using External Experts (Pages 13–16) Comment (p.27, lines 19–33): Rich qualitative design. Participant recruitment (line 37) is broad but lacks specifics on how sectoral balance (e.g., NGOs vs. academia) was ensured.

Suggestion: Include a table summarizing participant distribution by sector.

Ethics: Good attention to consent and bias mitigation (p.30, lines 1–9).

RESPONSE: Thank you. We have now included Annexe 5 to showcase the sectoral representation across the workshops.

Reviewer x11: *no comment*

Reviewer x12: no comments

RESPONSE: Thank you

Reviewer x13: *no comment*

Reviewer x14: N/A

RESPONSE: Thank you

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results (pages 17-96)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: *no comment*

Reviewer x11: *no comment*

Reviewer x12: no comments

RESPONSE: thank you

Reviewer x13: *no comment*

Reviewer x14: Each SSS has a final section on cascading effects on other Descriptors. I wonder if this could be illustrated with some sort of network diagram with arrows showing which way the cascade goes?

RESPONSE: We thank the reviewer for the remark. Indeed, this could be an interesting additional illustration. However, we feel the database would not allow for this type of diagram to be objectively produced at this posteriori stage. This is mainly because data per descriptor was extracted which are specific to each descriptor. Additionally, in order to provide a robust representation of cascades, this would require more in-depth expert consultation: but the policy window set by the requester would unfortunately not allow for this type of complementary work.

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: Remember to italicise the scientific names. I would also double-check the references cited in the document with those listed in the references section, as some did not match. For example, reference 13 on page 30 refers to plaice and cod, but the cited reference is about gannets.

RESPONSE: Thank you for the reminder to italicise scientific names., consider it done.

Reviewer x19: *no comment*

Reviewer x20: In general, please check that citations are consistently and properly formatted. I am unsure which referencing style is being used, but it appears inconsistent and often the publication year is omitted. Results can sometimes read as just a listing of facts, without a cohesive narrative (see some examples in line specific comments) and in some cases results presented do not appear relevant to wind farms. I would recommend synthesizing the results and where possible drawing out common themes between the publications and having one statement supported by multiple supporting references to show agreement. In some cases, it might help for the comprehension of the reader to present results grouped by their evidence type, as this has bearing on what can be inferred/extrapolated from the result (especially considering the differentiation between observational/modelling results was pointed out in the conclusion).

RESPONSE: We appreciate the reviewer's excellent feedback. To help ease understanding and group results by evidence type, we have added new figures throughout that provide this information. Likewise, we have provided updated figures 9, 10, and 11. Although we are not opposed to grouping literature by evidence type, we feel it would be more useful to group literature by Taxa group, even if this means citing the same papers in certain cases.

Results - Short Scientific Summaries - Descriptor 1 Marine biodiversity (pages 17-30)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6:

Point 1 states: "The construction of the OWFs causing the displacement of various species populations, disturbances to the benthic sessile fauna and marine mammals and fish reacting negatively to underwater noise" Point 6 states: "(D6): OWFs impact macrobenthic communities in the sea floor through colonisation and increased productivity, but also lead to habitat loss, shifts in species dominance, and the spread of non-native species. These changes can cause cascading effects across trophic levels. The ecological impact of related management measures, like bottom-trawling bans, remains unclear in the short term. Significant knowledge gaps persist regarding long-term and broader-scale seabed impacts, as well as effects across different stages of OWF development, including decommissioning" The ecological effects of bottom trawling ban measure, should be well documented in several scientific publications even if the studies are not carried out within OWF plants. The habitat loss should be better introduced and explained. We should discuss a shift of habitat instead of a loss of habitat. The "disturbances to the benthic sessile fauna" should be contextualised considering the percentage of the disturbed surfaces over the original habitat extent.

RESPONSE: We thank the reviewer for the input. Changes have been made to the executive summary. Regarding the comment on the ecological effects of bottom trawling and following the selection criteria for the literature used in the scoping review, one of the inclusion criteria is that the study assesses impacts inside OWFs (please see eligibility criteria and screening process sections of the [Methods protocol]). Therefore, studies assessing the effects of bottom trawling ban measures outside OWFs were not included in the literature. Regarding the definition of the term "habitat loss", physical loss and physical disturbance have been further clarified, as defined by the MSFD criteria for D6 where physical loss refers to a permanent change of the natural seabed. Following this definition, the introduction of permanent hard structures on soft-bottom habitats can induce a permanent change of the natural seabed. Habitats shifts are also reflected in D6 for changes in distribution and dominance of species, for example (see page 63-2) and disturbances are now contextualized to the nature of the studies..

Reviewer x7: Maybe, at the beginning, add the criteria assessed under the MSFD in the same way as done in D2

RESPONSE: We thank the reviewer for this feedback. We are in agreement. Thus, in order to harmonize the introduction sections for each Descriptor, we have added bullet points for each specific criteria for Descriptor 1. (Please see lines 20-26 p31, and lines 1 to 12 p 32)

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Descriptor 1: Marine Biodiversity (Pages 17–30 / PDF pp. 31–44) Strength: In-depth and multidimensional (species-level, behavioral, trophic). Comment (p.36, lines 1–16): The heatmap is effective. Consider adding absolute numbers in a caption for clarity.

Suggestion: Include more data on under-represented taxa (e.g., reptiles and cephalopods).

Critique: Cumulative effects discussion (p.43, lines 15–21) could be expanded to include seasonal interactions and climate stressors.

RESPONSE: Thank you for your comment. This has been addressed.

Reviewer x11: *no comment*

Reviewer x12: Page 24, line 36: 8% of what?

RESPONSE: The text was modified to add clarity

- page 25, line 26. I understood one of the latest reports of Vanermen (in the WinMon.BE series) as: auks are getting used to windfarms, densities within OWF increase.

RESPONSE: Thank you. Yes, behaviour might change, but we cannot reflect this in the text because we have to stay close to the literature we scoped.

- Page 26, line 10: this 10.4 reduction statement seems very strong. Is this 10/4% of the entire harbour porpoise population?. This number should be brought into perspective: local, regional…scale? The lines below do not really suggest such a negative effect.

RESPONSE: Thank you. This was checked and solved

- Page 27, line 11. Unclear to which Raoux paper is referred here, but generally the Raoux papers are based on simulated wind farms (non-existing wind farms). Such statements should actually be made on data-driven papers. If no information exists, then this should be considered a data gap

RESPONSE: Many thanks. *Missing citations have been included in D1. Modelling studies provide evidence that is included in our selection criteria for studies, so we do consider both in the SSS.*

-

  Page 27, line 15: if this is still based on a Raoux paper on a simulated wind farm: this needs to be rephrased, as these are projections, not facts!

RESPONSE: Many thanks. *The text can be rephrased, but data-based studies are not more facts because data also include biases: "**For example,** Atlantic cod was consumed approximately 3.5 times more by seals **according to the model prediction**, after the wind farm implantation. However, harbour seal biomass decreased from 6.73×10^{-4} to 1.89×10^{-3} gC m^{-2} yr^{-1} after construction, while grey seal biomass increased from 2.68×10^{-4} to 8.73×10^{-4} gC m^{-2} yr^{-1} **in the model.**"*

- Page 28: there is a lot more info on the effects of pile driving and seismic surveys than mentioned here. See papers by Van der Knaap et al and Vandenbussche et al. In addition, there is an effect of operational sound on larval fish (Crecci et al)

RESPONSE: We thank the reviewer for these suggestions, however we are limited to the studies we scoped for in the literature databases based on the criteria specific to the request (see Methods). We cannot add more at this stage.

- Page 28, line 16-end paragraph: these statements really need a reference, this is new to me.

RESPONSE: Thank you for this comment, references are now included.

- Page 28; see earlier remark on Raoux papers Page 28, item on pelagic habitats.

*RESPONSE: The text was modified to "No changes in biomass were found for either group before and after construction of OWF **according to the model results.**"*

- See earlier remarks on Raoux papers. It seems as if the authors missed the biological effect on the pelagic habitat (Slavik et al al, Voet et al) and the effect of the rotating blades (see papers by research group of Ute Daewel)

RESPONSE: We did not miss effects, rather did not find literature providing support on what the effects are. Thank you for suggesting these studies, but our search criteria did not scope them.

- Page 28; section on D1: not clear how gannets and loons are related to benthic habitats.

RESPONSE: Thank you for pointing this out, we have checked it: it is human error. The sentence has been deleted.

- In general, it seems as if the authors did not consider the work that has been done on the 'benthos' (Coates et al, Lefaible et al, Jammars et al, Coolen et al…)

RESPONSE: We thank the reviewer for this thorough feedback. We have modified the report text (please replies above)

Reviewer x13: *no comment*

Reviewer x14: Pg 28-1: For turtles you could include: https://doi.org/10.1016/j.scitotenv.2022.153803. They don't come up often but I was surprised you didn't find anything on turtles. 28-9: should this really say "reducing species that rely on soft-bottom habitats from the immediate area"? 28-17 - this point could do with a ref to back it up. 28-22: Do any such parks really exist beyond tiny demonstration sites? Can you provide an example? 28-40: I might have this one wrong….but how are gannets and loons losing benthic habitat? Should this be under pelagic habitat instead pg 30-35&36. This sentence needs rewording as it currently contradicts itself.

RESPONSE: We thank the reviewer for providing this interesting article reference. At this stage, and in respect to structures, objective evidence synthesis selection processes (cee guidelines and standards set by the CEE). We cannot add âpers at this posteriori stage.

Reviewer x15: Page 28, line 40: How do loons and gannets fit under benthic habitat? Those are birds. This must be a misplacement. Page 30, line 1: The decline in herring abundance should also be listed in the fish paragraph on page 28. Page 30 line 5: Marine Mammals and Fish bullet points lists only fish data. Hence, the bullet point should only be named fish. Page 30, line 27: Specify which species groups merit greater attention. It is not clear as it is written.

RESPONSE: We thank the reviewer for this comment. Concerning the sentence on loons and gannets under the benthic habitats: this is an error. The sentence in question has been deleted. Concerning line 27, p30 that sentence referred to seals and dolphins, as it mentions "these".

Reviewer x16: *no comment*

Reviewer x17: Sentence structuring on P17 L32-P18 L3 is confusing. The figure assists with understanding but the text should still be reworked for clarity. The bullet point structure from P29 L35-P30 L21 comes out of nowhere; I suggest adding a heading or leading statement beforehand.

RESPONSE: RESPONSE: Thank you for your comment. This has been addressed.

Reviewer x18: Identified knowledge gaps - the need for moving beyond taxonomical indices and measures to functional traits and indices could be highlighted here.

RESPONSE: RESPONSE: Thank you for your comment. This has been addressed.

Reviewer x19: Very nice chapter! I understand that you excluded non-EU studies. But maybe, for cases where there is no information at all available (e.g. whales, sea turtles), you could think of mentioning insights from other seas outside of Europe (?)

RESPONSE: We thank the reviewer for this helpful insight. At this late stage, we are unfortunately not able to search for any complementary literature outside of the EU. Indeed, this literature falls outside of the scope of the review. We prefer to stay as factual as possible, rather than speculating if any literature exists outside the EU.

Reviewer x20: - I think the terms 'scientific article' and 'case study' are sometimes used interchangeably in the text, which generates some confusion as to the difference (they are separated in the legend of Fig. 8). Also, I am unsure what '[]' indicates. - Line 12: How much is 'most'? - Line 17: Reference to Fig 6 should be Fig 9? - Fig 10: I'm a bit unsure how Ecosystem functioning indices (x axis) is a relevant metric at the species-level (y-axis) as they often occur at the level of multiple species/communities – perhaps this explains why this is a gap? - I thought the information presented in the figures were very helpful to support the main knowledge gaps identified – particularly the heatmaps and Sankey diagrams - Pg 24: I found this a bit difficult to digest. While directionally the impacts may be heterogeneous, it might also help for the comprehension of the reader to present results grouped by their evidence type, as this has bearing on what can be inferred/extrapolated from the result. For example, inferring a potential impact from the overlap of flying height and rotor blades, vs observed decreases in abundance. Perhaps also structuring the results into a more cohesive narrative, presenting similar results together with one sentence with multiple references. For example, studies comparing distribution/flying height co-located with wind farm installations are presented at various points through the paragraph. - Pg 26 lines 14-16: What is the relevance of this information to wind farms? Does this mean that because they prefer offshore waters the impacts of wind farms closer to the coast are likely less?

RESPONSE: We thank the reviewer for the very useful feedback. Line 17: Reference to Fig 9 instead of Fig 6 has been corrected. To ease understanding in terms of type of evidence, we have provided a new figure 9 with an additional panel accompanying the former. This provides a clearer structure of the dataset.

Results - Short Scientific Summaries - Descriptor 2 Non-indigenous species (pages 31-35)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: I think there are too little papers

RESPONSE: The final number of articles included in the SSS was determined based on our predefined methodology framework, including search strategy, eligibility criteria, and screening procedure. We also transparently acknowledged the limitations in our literature search approach (see pages 103–104).

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Clarity: Sparse data but clearly communicated.

Comment (p.49, lines 7–14): Valuable emphasis on stepping-stone effects. Could benefit from referencing port infrastructure literature for broader comparison.

RESPONSE: We appreciate the suggestion to reference port infrastructure literature. However, to maintain consistency with our methodology, we will integrate only the findings directly extracted from the studies we selected previously.

Reviewer x11: *no comment*

Reviewer x12: Page 34, Section on non-indigenous species. Seems to be very limited, see ICES WKCOMPORE report for a more elaborate reporting.

RESPONSE: Thank you for your comment. However, this would constitute grey literature. Grey literature is excluded as noted in the report.

Reviewer x13: *no comment*

Reviewer x14: No Comments

RESPONSE: [Response here]

Reviewer x15: Good

RESPONSE: thank you

Reviewer x16: *no comment*

Reviewer x17: No text based description on why studies were excluded.

RESPONSE: Thank you for your comment. Details of the search strategy and paper selection criteria for all descriptors can be found in the Methodology section, with a more comprehensive description in Annex 3 and 4.

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Short Scientific Summaries - Descriptor 3 Commercial fish and shellfish (pages 36-42)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: ok

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: nothing to add

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Strength (p.54): Comprehensive integration of ecological, economic, and social dimensions.

Critique: No mention of ecosystem services.

Suggestion: On p.56, lines 1–17, include discussion of potential long-term genetic adaptations due to OWF presence.

RESPONSE: We thank the reviewer for pointing out this topic, yet the evidence body was weak and might require a stronger thematic search, therefore, we would like to acknowledge the issue, yet, we cannot support it with deep insights.

Reviewer x11: *no comment*

Reviewer x12: Page 40, section on ecological impacts on fish. This seems rather incomplete. Pressures related to OWF affect multiple life stage of fish species (example: effect of turbine noise on larval orientation)…entirely not taken into account here. Suggest to explore how pressures affect fish species across life stages and how this cascades in metrics assesses for the MSFD framework. Page 41: I am not sure someone described a 'disruptive' effect of OWFs on food webs. This statement needs a reference, or it needs to be deleted. Page 41: line 27: quite a statement without references.

RESPONSE: We thank the reviewer for this comment. Multiple life stages of fish were not addressed under the search criteria for D3, even though their importance needs to be acknowledged. Noise effects are covered under D11, *therefore they do not occur beyond a simple mention in D3 . We cross-referenced results for D11 for better direction of the reader.*

As to page 41, we changed the wording to "modification".

The part on genetic adaptations has been deleted.

Reviewer x13: *no comment*

Reviewer x14: pg 36-25 - I think the link between this criteria and OWF needs to be explained a bit in the text. It is not particularly clear until later why this criteria is relevant.

RESPONSE: We acknowledge that this might be confusing if readers are not familiar with the MSFD, but this part of the SSS is just a short overview. Explaining the link between OWF and the specific criteria would require literature that is then described in the SSS. The point of the SSS is to find potential links between OWF impacts and the descriptors and its criteria.

Reviewer x15: Page 38, line 1-4: Language used in the study type description in the text should match the Type in Figure 17 b.

RESPONSE: Thank you for this comment, this has been addressed throughout the specific paragraph.

Reviewer x16: *no comment*

Reviewer x17: As above. This is inconsistent with the level of detail provided for Descriptor 1. Fig 19 text illegible

RESPONSE: We added this sentence "Studies that were discarded followed exclusion criteria described in the Methods section." to refer readers to our methods criteria. The same level of description as for D1 was not possible given the timeline for this request, and D3 does not represent as much as D1. D1 includes all biodiversity components and habitats directly linked to other descriptors, D3 only covers one ecological compartment. It's as if D1 covers 7 descriptors into one, so it's natural that its size and level of detail is further represented in this report.

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: Very nice chapter! P36, L.33: Actually, due to the 'fuzziness' of D3C3, the GES assessment for D3 is based only on D3C1 and D3C2. See here: https://www.aquabiota.se/wp-content/uploads/european-commission-2022.-msfd-cis-guidance-document-no.-19-article-8-msfd-may-2022.pdf (page 141, 'Use of Criteria') P42, L30: My own concluding impression after reading this very nice chapter was that effects on commercial species are generally positive (especially on demersal fish and crustaceans); albeit uncertain, especially in the long-term. I would intuitively expect this positive 'artificial reef effect' to be even more pronounced in oligotrophic seas (e.g. central and east Med), where unfortunately no studies are available. So I found somewhat unexpected the neutral tone of the conclusions. Maybe consider spelling out the positive (and negative, if any) effects, like it is done for D4 in P50?

RESPONSE: Thank you. We are not evaluating which criteria are used for assessments or not in this report. We included elements to support our conclusions for the descriptor. "Positive" effects need to be taken carefully since larger-scale effects are rarely assessed and fish aggregation around OWFs does not prove overall increase in population abundance, especially when early life stages are affected by OWFs as well.

Reviewer x20: *no comment*

Results - Short Scientific Summaries - Descriptor 4 Food webs (pages 43-50)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: nothing to add

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Strength: Biogeochemical feedbacks are well-addressed.

Comment (p.63, lines 31–39): Could add more on vertical vs horizontal energy flow disruptions.

*RESPONSE: this comment does not seem to refer to the SSS on D4, and we cannot add new themes to D4 that are not reflected in the literature selected through the methods criteria. However, this idea has been added to the knowledge gaps: "Changes in trophic guild structure and composition: research on the impacts of OWFs on the composition, relative abundance, and size distribution of individuals in the trophic guilds remains limited. Some key questions include: Do artificial structures favour specific functional groups (e.g., sessile filter-feeders) while disadvantaging others (e.g., soft-sediment specialists)? **How do they impact horizontal and vertical food web diversity?**" (Pag 49. Lines 21 - 31)*

Reviewer x11: *no comment*

Reviewer x12: Page 47 line 27: which paper is this.? Based on field data, or from a simulated wind farm? Page 47, line 31- 37. Should this be here, or go to D6? Page 47, Line 38-39: probably also relevant for the descriptor on the pelagic system?

RESPONSE: Thank you for your comment.Page 47, line 27: This article presents scenario modelling of the ecosystem before and after OWF construction.
Page 47, lines 31–37: While the paper has been also considered relevant for Descriptor 6 (D6), we believe that, given the interrelationships between descriptors, its findings are particularly pertinent to Descriptor 4 (D4). Papers that are relevant for multiple descriptors were integrated in the extraction of literature for multiple descriptors as well (see Methods).
Page 47, lines 38–39: We agree, and this paper has also been considered under Descriptor 1 (D1, pelagic systems).

Reviewer x13: *no comment*

Reviewer x14: Pg 43-8+ Could you lay out the criteria in the same way as the other SSS? It makes it easier to read. Pg48-3 I'm not really clear why this is relevant to food webs. Could you add a sentence or two to explain the context? pg 49-7 seems to contradict pg 50-14. I suggest leaving on the word "significantly" on page 50 would fix this. 49-6+: No action. This section is very good.

RESPONSE: Thank you for your comment.

Pg 43-8+: The text has been modified following the same format as the other descriptors.

Pg 48-3: Thank you for pointing this out. We have revised the text to improve clarity and provide context.

Pg 49-7 and 50-14: The text has been modified and the word "significantly" eliminated.

Reviewer x15: Page 48, line 19: Please explain meaning of incomplete sentence “Small-scale study (one turbine).»

RESPONSE: Thank you for your feedback. The text in question has been revised and removed. However, the main idea is also addressed in the "Knowledge Gap" section, which discusses the spatiotemporal influence of impact.

Reviewer x16: *no comment*

Reviewer x17: The bullet point structure from P48 L26 seems unjustified (see comment in response to D1 above).

RESPONSE: Thank you for your comment. We have modified the text accordingly.

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Short Scientific Summaries - Descriptor 5 Eutrophication (pages 51-57)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: nothing to add

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Suggestion: Include region-specific eutrophication risks—Mediterranean vs Baltic dynamics differ substantially.

Critique: Very limited citation of nutrient modelling studies.

RESPONSE: Thank you for your comment. The screened articles from which data was extracted for D5 were few including articles on predictive modelling and they did not include any studies in the Mediterranean region (please see Figure 25).

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: No comments

Reviewer x15: Page 40, line "real edge effects due to changes in fisheries intensity or 'spillover' from the wind farms could not be shown" might deserve more cautious wording – or has this been exhaustively studied?

RESPONSE: Thank you for your comment. There are studies on this, references and explanations have been added)

Line 29: "Studies show competition for fish stocks." Too general, specify and reference.

RESPONSE: Thank you for your comment. We have clarified the section and added references).

Page 49 lines 37 and 38 – Specific question "How do…" (as in line 29) is better than general "Could …"

RESPONSE: [Response here]: Thank you for your comment. The amendment has been made.

Reviewer x16: *no comment*

Reviewer x17: No text based description on screening process. Key findings (staring P55) should be broken into paragraphs for readability.

RESPONSE: Thank you for your comments. Text describing the screening process has been included. Also, the key findings have been broken into paragraphs.

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Short Scientific Summaries - Descriptor 6 Seabed integrity (pages 58-64)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: Point 6 states: "(D6): OWFs impact macrobenthic communities in the sea floor through colonisation and increased productivity, but also lead to habitat loss, shifts in species dominance, and the spread of non-native species. These changes can cause cascading effects across trophic levels. The ecological impact of related management measures, like bottom-trawling bans, remains unclear in the short term. Significant knowledge gaps persist regarding long-term and broader-scale seabed impacts, as well as effects across different stages of OWF development, including decommissioning" The ecological effects of bottom trawling ban measure, should be well documented in several scientific publications even if the studies are not carried out within OWF plants. The habitat loss should be better introduced and explained. We should discuss of a shift of habitat instead of a loss of habitat. The "disturbances to the benthic sessile fauna" should be contextualised considering the percentage of the disturbed surfaces over the original habitat extent

RESPONSE: Following the selection criteria for the literature used in the scoping review, one of the inclusion criteria is that the study assesses impacts inside OWFs (please see eligibility criteria and screening process sections of the Methods protocol), therefore, studies assessing the effects of bottom trawling ban measures outside OWFs were not included in the literature. Regarding the definition of the term "habitat loss", physical loss and physical disturbance *have been further clarified, as defined by the MSFD criteria for D6 where physical loss refers to a permanent change of the natural seabed. Following this definition, the introduction of permanent hard structures on soft-bottom habitats can induce a permanent change of the natural seabed. Habitats shifts are also reflected in D6 for changes in distribution and dominance of species, for example (see page 63-2) and disturbances are now contextualized to the nature of the studies.*

Reviewer x7: nothing to add

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Strength: Solid integration of biodiversity and substrate interaction.

Comment: Decommissioning phase effects are mentioned briefly (p.64, lines 30–31). Should be emphasized more explicitly.

RESPONSE: Thank you for your feedback. The results mentioned in the SSS are a reflection of the methods used in the scoping review. As only one paper on decommissioning was analyzed, this topic was primarily identified as an area with significant knowledge gaps to be addressed.

Reviewer x11: *no comment*

Reviewer x12: Page 63Key findings. There is is increasing evidence that there is an increased carbon accumulation in the sediments within OWF (De Borger eal), which points to a change in functioning of the seabed. Should be mentioned here

page 64: link to multiple pressures.: what about noise .There is increasing evidence of noise affecting invertebrate behaviour, including bioturbation and hence benthic ecosystem functioning

RESPONSE: Thank you for your comments and suggestions. Text from evidence for increased carbon accumulation in sediments has been added to the SSS D6. Regarding underwater noise impacts from OWFs, such effects are addressed in D1 and D11. Since there is a specific descriptor addressing these impacts on different taxonomic groups, the results of the scoping review on this topic is not presented here.

Reviewer x13: *no comment*

Reviewer x14: Pg 59-15+ This sub-section on thresholds is very useful. Could this be repeated in the other SSS's? Even if it is just a line to say no thresholds have been agreed for this descriptor?

RESPONSE: Thank you for your suggestion. Information of threshold values has been added to D10 and D11, being the other Descriptors with threshold values agreed by Member States.

pg64-17. I only have two OWF that have decommissioned so far - Yttre Stengrund (Sweden) and Vindeby (Denmark). Can you list all six? I checked the ref Spielmann et al 2023, but they ref a Chinese marketing company report, which in turn doesn't list any decommissioned OWF. Although one version of the report states 38.5 MW has been decommissioned that seems way too small to account for 6 OWF. Maybe they mean demo sites, but they don't really count. I suggest double-checking this number and listing the ones that have solid evidence for.

RESPONSE: Thank you for your comment. We have revised the text to more clearly address the knowledge gaps related to decommissioning.

Reviewer x15: Page 52, line 28, please indicate type of trend.

Page 61, line 2-4: Language used in the study type description in the text should match the Type in Figure 27b.

Page 63, line 36, It would be helpful to describe what shifts in pre-impacted communities means in simpler words.

RESPONSE: Thank you for your comment. The text was amended to improve the trends description and to match the terminology used in Figure 27b.

Reviewer x16: *no comment*

Reviewer x17: No text based description on screening process. Results from P60 L4 - P62 L14 should be given as paragraphs/sentences to remain consistent with other sections.

RESPONSE: Thank you for your comment. The description of the screening process for the development of all SSS can be found in Section 3 "Methods" of the report. All results and knowledge gaps sections have been given paragraphs/sentences to remain consistent with the rest of the sections.

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Short Scientific Summaries - Descriptor 7 Hydrological conditions (pages 65-69)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: It is mentioned (p. 68, l. 38) that most if not all studies concern the North Sea/Baltic, with specific conditions (depth, currents, salinity, sediment, waves…). Not sure all conclusions could be extrapolated to more energetic regions, or deeper windfarms, or larger and more widely spaced turbines (lower density).

p. 68 l.37 : Beyond knowledge gaps regarding the impacts of OWFs, it could be mentioned that there are also major gaps related to the GES determination for D7, that is still far from consensus. It could be mentioned that, unlike several other GES descriptors, there is no EU specific WG for D7, and GES for this descriptor is still underdetermined in many MSs (source : MSFD assessments cycles 1 and 2), which may weaken the conclusions that could be drawn from analysis of the existing scientific literature.

Cumulative (cascade) impacts linked to hydrographical conditions can be important in the first windfarms (shallow water, smaller and denser fixed turbines, not very energetic areas); but as more and more OWFs in the future will be floating turbines in larger depths, the study of the impacts of such OWFs should probably be prioritized in the future.

RESPONSE: Thank you for your comments. These gaps have been also mentioned in the report.

Reviewer x6: *no comment*

Reviewer x7: nothing to add

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Pages 65–88

General Feedback: Detailed and data-rich, but uneven in depth.

RESPONSE: Thank you for your comment. The information gathered is balanced with the rest of descriptors.

Reviewer x11: *no comment*

Reviewer x12: Page 67 and further: it is not clear whether the described effects are caused by the presence of the turbines under water, or are also related to the rotation of the blades. If not considered: suggest to add, and clearly make the difference with the effects resulting from the presence of the turbines

Page 69: Line 10. When considering effects of blades, this is probably not specific to monopiles

RESPONSE: Thank you for your comment. This result reflects what we could find in the screening of scientific literature.

Reviewer x13: *no comment*

Reviewer x14: pg 67-15: Can you give examples of approximate size/range of scour pits to help the reader visualise these? pg 68-3: Can you say where, or at least give examples. Currently it reads like this happens everywhere. 68-17: I'm not sure about this sentence; I think it just needs rewording a bit as the points don't really come out. Why is the tidal flow already reduced? Presumably because 1 OWF can reduce flow. And presumably if the basin is full of OWF this effect is increased cumulatively? 68-20: This is a very strong statement and I'm not sure it is correct, or at least the norm. Can you give ref(s) to support it? Otherwise I think it needs toning down. 68-27: This implies that OWF scour ends up in navigation channels e.g. harbours. Is this really true? I've never come across it, although I suppose it could happen in very specific locations. Can you add ref(s) to support? 68-32: REf? I've never seen or heard of anyone developing a mitigation strategy for tidal flow, sedimentation. I guess there could be in specific locations???

RESPONSE: Thank you for your comment. The commented arguments are justified with the citation of scientific studies that reflect these results.

Reviewer x15: Page 68, line 2: Please describe "starving of sediments in simpler words.

RESPONSE: Thank you for your comment. This sentence has been reformulated.

Reviewer x16: *no comment*

Reviewer x17: No text based description on screening process. It would be better to have text before F31 to make the heading more apparent. Figure not referenced in text at all.

RESPONSE: Thank you for your comment. Text included before F31.

Reviewer x18: Should the info on floating structures be omitted for consistency?

RESPONSE: Thank you for your comment. Information updated in the conclusions section.

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Short Scientific Summaries - Descriptor 8 Contaminants (pages 69-75)

Reviewer x1: Page 74, lines 29-30. There is limited knowledge about the contaminant release from OWFs during construction, operation and decommission and their impacts on the marine environment.

I would add 'extremely' or 'minimal' before limited. Considering only 3 papers found for the review.

Page 74, lines 35. long-term release and ecological effects of contaminants from corrosion protection galvanic anodes (e.g., Gallium, Zinc, Indium).

Should include aluminium as this dominates the GACP composition.

P 75, lines 6-8. While evidence of the impacts of OWFs on contaminants is limited, metals released from corrosion and biofouling protection measures are at levels which do not give rise to pollution effects. However, there are substantial knowledge gaps including understanding long-term impacts and impacts of emerging contaminants.

This statement is not true. One cannot conclude that there are no effects from metals as the scientifically robust studies have not been conducted. Those papers cited in the review are: a) missing data, b) do not separate effects from background concentrations and/or have not measured the correct metals in the relevant phases.

RESPONSE: Thank you for your suggestions and comments. They have been addressed.

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: very little papers. This is an example in which bringing papers from outside Europe can benefit the evidence, since the pathways could be exactly the same in Europe or outside. A recent revision found many substances: Elena Hengstmann, Pablo Zapata Corella, Katharina Alter, Maria J. Belzunce-Segarra, Andy M. Booth, Javier Castro-Jiménez, Niklas Czerner, Karien De Cauwer, Geneviève Deviller, Alessio Gomiero, Nils Goseberg, Simone Hasenbein, Torben Kirchgeorg, Claire Mason, Wiebke Pape, Koen Parmentier, Anna Plaß, Daniel Pröfrock, Ali Sarhadi, David Vanavermaete, Johan van der Molen, Pedro Almeida Vinagre, Daniel Wood, Ingo Weinberg, Christian Windt, Alexa Zonderman, Jennifer Kenyon, Bavo De Witte, 2025. Chemical emissions from offshore wind farms: From identification to challenges in impact assessment and regulation, Marine Pollution Bulletin, Volume 215, 117915,

RESPONSE: Thank you for suggesting a recent article published in June 2025. The keywords used in the search strategy for articles for the scoping review, as detailed in Annexe 3 were subjected to a comprehensive review process and were deemed appropriate and validated by external reviewers.

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: 7–11 (Hydrological to Underwater Noise) Pages 65–88

General Feedback: Detailed and data-rich, but uneven in depth.

RESPONSE: Thank you for your general feedback on descriptors 7 - 11 (pages 65 -88).

Reviewer x11: *no comment*

Reviewer x12: no comments

RESPONSE: [Response here]

Reviewer x13: *no comment*

Reviewer x14: Pg74-32 - This is probably covered in the EIA documents. Recognise that these are outside scope of review, but it might be worth mentioning. It's certainly standard practice in UK to sample for containments in UK before any ground work.

RESPONSE: Thank you for your comment. EIA documents would constitute grey literature. Grey literature including government documents were excluded as noted in the report.

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: No text based description on screening process. Study type description confusing and ignores the review article. Number of studies included really should be specified in the text for context on the weight of evidence.

RESPONSE: Thank you for your comments. Text describing the screening process has been included. Also, the study type description has been amended to provide clarity.

Reviewer x18: I would break the long sentence from line 11 to 17.

RESPONSE: Thank you for your comment. This has been addressed.

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Short Scientific Summaries - Descriptor 9 Contaminants in seafood (pages 75)

Reviewer x1: Even though there were no studies, there should be a conclusion that these data need to be collected as the plan is to co-locate many species (mussels, oysters, seaweed) with OWFs in the future for many European OWFs.

RESPONSE: thank you, this SSS was corrected with more context and the following conclusion was added: "Our search criteria shows evidence of a major knowledge gap in the scientific peer-reviewed literature on this theme, which deserved more attention and represents a major focus, especially when OWFs may be considered as facilitating aquaculture (e.g. mussel)." The following point was also added in the knowledge gaps section "D9: no paper was found for evidence of contaminants in seafood in relation to OWFs, while OWFs artificial reefs have been considered to potentially facilitate aquaculture (oyster, mussels etc.)"

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: same as above

RESPONSE: thank you, yes, we did not find papers related to this descriptor. We cannot add new references to the SSS as it is only supposed to be based on the references found via the scoping review method. That does not mean evidence does not exist from elsewhere outside of Europe for instance, but that we did not find papers based on our search criteria.

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Descriptor 9 (p.75): A single paragraph—needs elaboration or a recommendation for urgent research

RESPONSE: thank you, this SSS was corrected with more context and the following conclusion was added: "Our search criteria shows evidence of a major knowledge gap in the scientific peer-reviewed literature on this theme, which deserved more attention and represents a major focus, especially when OWFs may be considered as facilitating aquaculture (e.g. mussel)." The following point was also added in the knowledge gaps section "D9: no paper was found for evidence of contaminants in seafood in relation to OWFs, while OWFs artificial reefs have been considered to potentially facilitate aquaculture (oyster, mussels etc.)"

Reviewer x11: *no comment*

Reviewer x12: *no comment*

Reviewer x13: *no comment*

Reviewer x14: No comments

RESPONSE: thank you

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Short Scientific Summaries - Descriptor 10 Marine litter (pages 75-79)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: Nothing to add

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: good.

RESPONSE: thank you

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: pg 78-20 (and 79-27): You could mention that OSPAR ICG-ORED has recently just set up a sub-group to look at micro-particle emissions from OWF. There is also at least one paper in publication on litter from OWF. It's an emerging issue. 78-26+ Not sure how relevant these currently are to OWF. I suggest you reword to make links to OWF clearer.

RESPONSE: Thank you for your comment and helpful suggestions. The summary comments on papers identified via the review. We can mention the OSPAR's focus in the discussion section as part of a note, thank you for pointing the relevance of this work. *Regarding page 78-26+, where there is no clear links to OWF this was mentioned and the bullet point on dredging effects is edited to reflect the uncertainty.*

Reviewer x15: Page 78, line 11: Unclear sentence: …study suggests that marine litter in the region is the impact of human activities…?

RESPONSE: Thank you for your comment, we reviewed again the study and edited wording on sources of litter /human activities studied which were mentioned in parenthesis, to clarify further.

Reviewer x16: *no comment*

Reviewer x17: No text based description on screening process. Information on study period and location not easy to identify.

RESPONSE: Thank you for your comment- additional text description was added in the main body with geographies in bold, mirroring the screening process described in the graph. The study period for reviewed papers is the same as for all summaries.

Reviewer x18: OK

RESPONSE: thank you for your comment

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Short Scientific Summaries - Descriptor 11 Energy, including underwater noise (pages 80-88)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: Point 1 of summery states: “The construction of the OWFs causing the displacement of various species populations, disturbances to the benthic sessile fauna and marine mammals and fish reacting negatively to underwater noise” Point 11of summary states: “(D11): Impulsive noise generated during installation was found to potentially harm marine mammals, although the main focus was on a single species, the harbour porpoise. Some behavioural changes in fish were also identified, but evidence was limited and highly variable at individual level. No effects were demonstrated on marine mammals in relation to continuous noise generated by the operational wind turbines while some fish appear to be attracted to the turbines. It cannot be established whether the attraction is related to prey availability or a reaction to the sound.” These two points are not coherent and while in Point 1 is suggested a clear disturbance on mammals and fishes because of the underwater sounds, in point 11 is stated that there is no negative effects are reported on mammals and fishes during OWFs.

RESPONSE: thank you for highlighting this point. We have repphrased the summary to clarify the point and avoid incoherence

Reviewer x7: Nothing to add

RESPONSE: thank you

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Critique: Too focused on harbor porpoise. As noted (p.88, line 16), there’s a critical gap in data on baleen whales and species with different hearing ranges.

RESPONSE: the summary is based on the references; indeed considering that most references are on this species it follows that the summary mainly summarises the findings on porpoise.

Reviewer x11: *no comment*

Reviewer x12: page 84, Line 11: there is info on impulsive sound on fish species (Van der Knaap et al, Debusschere et al) , and operational sound on fish larvae (Crecci et al)

*RESPONSE:*yes these studies are included in the findings - We found that there was some issue with th referencing and some of the cross-references were misaligned. THe Debusschere study did not get picked up in the literature search probably due to the lack of “wind farm” reference in the keywords of the paper.

Reviewer x13: *no comment*

Reviewer x14: pg 87-1: What is tilt angle? Can you add an explanation in brackets? pg 87-3: Refers to EMF, in which case should this be in a section under noise pollution (see also next comment) pg 88-2: EMF doesn’t currently have any MSFD criteria - so presumably this is why you would have found much. Given it has been a topic of a lot of discussion I suggest you mention EMF in the opening of this SSS in terms of MSFD criteria so it clear to the reader. There will probably be people less familiar with MSFD reading.

pg 88-12: I suggest mentioning the sound sources of pre-construction surveys, UXO removal etc. at the beginning of this section to make it clearer to the reader. Perhaps before pg85-9

RESPONSE: Thank you for the constructive comment. We have elaborated more in the context part (introduction) of the SSS regarding EMF and also the UXO removal etc are mentioned in that section.

Reviewer x15: Page 86 line 32, please describe in the text what “acoustic encounters” are; line 42: describe “increased source level”; page 87, line 1, add direction of effect.

RESPONSE: Added further explanation to address the comments

Reviewer x16: *no comment*

Reviewer x17: I recommend combining Fig 39 and Fig 40 into one to make better use of space.

RESPONSE: thank you. We kept these separate due to difference in topic presented

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Workshop summary findings - Cluster 1 (page 80)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Strength: Effective use of clusters.

Comment: Cluster discussions (pp. 90–94) would benefit from quotes or anonymized comments to add stakeholder voices.

Suggestion: Use visuals or summary boxes for each cluster.

RESPONSE: Thank you for the suggestion. The workshop used the mural platform to capture and summarise voices. While we agree that including stakeholder voices can enrich the cluster discussions, capturing representative examples from each cluster is tricky as selective quoting risks over-emphasising particular perspectives and may not reflect the full diversity of input. To balance this, and in line with EKLIPSE's commitment to transparency, we have referenced the mural platform used to enable people to view the material if they so wish. A footnote is used for this purpose. This would allow readers to explore the full range of stakeholder contributions and context behind the clusters, without privileging specific voices in the summary text.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: pg 89-5: I think it would be worth reminding the reader here why the clusters are what they are. i.e. why was noise included with birds and mammals and not other pressures like contaminants and litter.

*RESPONSE:*many thanks for your commnets This is addressed in the method section.

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Workshop summary findings - Cluster 2 (pages 90-91)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10:

Good explanation

RESPONSE: thank you

Reviewer x11: *no comment*

Reviewer x12: no comments

RESPONSE: thank you

Reviewer x13: *no comment*

Reviewer x14: Pg 90-9: Is this covered under D2,C2 - Secondary? (I might be wrong on that). 90-38: Pile driving - do you mean the noise/vibration impacts on benthic habs? Or the placement of the monopile or both. Suggest making this clearer.

RESPONSE: Many thanks for your constructive feedback. The comment regarding D2C2 has been addressed. The intention was to highlight that MSFD does not fully cover the issue of stepping stones when e.g. unwanted native species also colonise these structures, leading to dominance shifts in the ecosystem. We have made clear that, in the case of NIS, these are addressed by D2. Moreover, we have further clarified the line 90-38, referring to vibration impacts on benthic habitats.

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Workshop summary findings - Cluster 3 (pages 91-92)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: Given the surprising perimeter of this cluster (D1 fish - not benthic habitats -, D2, D5, D7), I am not sure that all conclusions are interesting for D7. The potential of modeling with assimilation of in situ data could have been more highlighted, for instance to address cumulative impacts (of many turbines, of several OWFs, and of other maritime activities including dredging and trawling).

RESPONSE: Thank you for your comment. Indeed the variety of issues under this cluster may include information not always pertinent to D7-the focus of experts in the workshop also guided the discussions to an extent and we can recognise this here. The choice of cluster groups included also a practical component of clusters that were meaningful and possible to cover within the timeline of the workshop. We have reviewed the actual Miro board comments and offer them to reduce bias in the 'summary report' provided.

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10:

Good explanation

RESPONSE: thank you

Reviewer x11: *no comment*

Reviewer x12: no comments

RESPONSE: thank you

Reviewer x13: *no comment*

Reviewer x14: 92-22. What do you mean by GES framework? I think there is an important point being hinted at here, but I can't work out what it is supposed to be. Can you reword?

RESPONSE: Thank you for this comment. We clarified the References to GEs and specifically issues with cross-descriptor issues and thresholds so that is clearer to all readers

Reviewer x15: Page 90, line 10, please explain "stepping stone" effect.

RESPONSE: Thank you for your comment, the wording has been elaborated to explain this here. Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Workshop summary findings - Cluster 4 (pages 92-94)

Reviewer x1: P 93. 15-18. A specific need for research linking microplastics, metals, and other contaminants to the contamination and consumption of seafood was discussed. The importance of such studies for demonstrating cumulative impacts and drawing connections between D9 and D10 was stressed, as was their significance for public health.

I recommend adding a sentence about the potential for co-location for aquaculture as a driver for assessing seafood contamination.

RESPONSE: Thank you, this is indeed an important aspect of the discussion and we added a part to recognise the recommendation made for aquaculture and the aspect on links between D9 and D10.

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10:

Good explanation

RESPONSE: thank you

Reviewer x11: *no comment*

Reviewer x12: no comments

RESPONSE: [Response here]

Reviewer x13: *no comment*

Reviewer x14: pg93-29-30: What is “distinct littering”?? Suggest this needs rewording.

RESPONSE: Thank you , reworded to clarify.

Reviewer x15: Page 93, line 3, please expand on what you mean by “the limited integration of non-academic evidence, industrial practices, and regulatory frameworks into the review”. Also the link/flow of this to the following sentence is not clear.

RESPONSE: Thank you we reworded here to explain the exclusion of grey literature and non-focus on regulatory framework analysis.

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Results - Workshop summary findings - Plenary discussion and implications for policy (pages 94-96)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: p.94 l.25 : the findings confirm current assessment of gaps within the industry and environmental assessement communities. p. 95 l l. 12: the potentiel of modeling is still too often underestimated; when it comes to cumulative impact assessment it could be used from the planning level. Modelling should be required by regulations at all stages, which is the best way to o support the development of operational tools. p. 95, l.33 : high resolution baseline surveys (depth, relief, sediment…) before construction and periodically during the operational phase are the best way to monitor changes of hydrographical conditions (D6 and D7)

*RESPONSE:*Thank you for your thoughtful suggestions on strengthening the summary of core findings. We have revised the text to clarify the role of modelling, reflecting the extent to which it was discussed during the workshop. Where appropriate, we have incorporated references to its potential use at the planning stage and the need for regulatory support. The specific point regarding high-resolution baseline surveys has been integrated as an enhancement to the section on modelling and monitoring. For transparency and completeness, we also refer readers to the Miro board, which contains the full set of comments gathered during the plenary discussion.

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10:

Good explanation

RESPONSE: thank you

Reviewer x11: *no comment*

Reviewer x12: no comments

RESPONSE: [Response here]

Reviewer x13: *no comment*

Reviewer x14: pg 94:36 - hmmm, I'm not sure there has been in the way of assessment frameworks for O&G industry. It always seem they avoid as much environmental monitoring as possible? But you could refer to the INSITE programme. 94-39: Quality assessment? Should this be EIA? Or assessment of GES?? Quality assessments could mean something quite different e.g. quality assessment of a manufactured product. 95-7: Licensing ratings for OWF - what are these?? Suggest this could be reworded to be clearer. 95-19: These are not tools, they are working groups. They could be a source of info about tools - this needs rewording. 95-28/29: Switch decom' and survey stages around? Presume you are talking about the pre-construction stage so I would suggest putting these in chronological order.

RESPONSE: thank you for mentioning the INSITE programme due to its unique focus on long-term study design and decommissioning, thank you we added a reference. 94-39: Quality assessment clarified in text.95-7: thank you, reworded.95-19: edited, thank you for noticing the issue here. Line 28/29 edited!

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Discussion

Discussion - Cumulative impacts and effects - Cumulative effects of OWFs as opposed to other human activities and impacts. (pages 97-98)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: *no comment*

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Cumulative Impacts and Effects Page 97–100: Excellent multi-tier typology of cumulative effects. Strong conceptual framing.

RESPONSE: thank you

Reviewer x11: *no comment*

Reviewer x12: no comments

RESPONSE: thank you

Reviewer x13: *no comment*

Reviewer x14: General: I was surprised this section didn't have any references.

RESPONSE: true, references have now been added throughout.

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: - Page 97. I am uncertain whether the section 'Cumulative effects of OWFs as opposed to other human activities and impacts.' Is properly titled, as it seems to deal with studies on the interactions of effects of OWFs and other pressures, not comparing them which is implied by the terms 'as opposed to'.

RESPONSE: thank you, the title was changed to "Cumulative effects from OWFs and other human activities."

Discussion - Cumulative impacts and effects - Impacts arising from the development of more than one OWF (pages 98-99)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: *no comment*

Reviewer x5: p. 98 l.1 : I am surprised by the conclusions about OWFs and eutrophication (D5), which has not been documented in the Atlantic, even in highly eutrophied areas. Maybe I missed something, Or there may be a bias linked to the selection of studies ?

RESPONSE: Thank you for your comment. The keywords used in the search strategy for articles for the scoping review of D5, as detailed in Annexe 3 were subjected to a comprehensive review process and were deemed appropriate and validated by external reviewers.

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10:

Good explanation

RESPONSE: thank you

Reviewer x11: *no comment*

Reviewer x12: page 99: it seems as if the cumulative effect of multiple wind farms extracting a lot of energy from the air, and the potential effects on stratification and turbulence cascading to primary production are not fully addressed here. At the same time, there will be effects of the fouling fauna (acting as a filter) interacting with the effects of the turbines (below sea surface) and the rotating blades (above the sea surface) on primary production / standing stock. This combined effect of biological and physical changes is not clearly addressed. This has not been investigated yet, but the fact that the separate effects are there is clearly documented.

RESPONSE: Thank you for your feedback. As mentioned in the SSS of D7, hydrographic changes can lead to impairment of primary productivity due to reduced light penetration. However, even when cumulative effects of multiple OWFs might even affect zooplankton distribution, higher trophic chain effects remain largely unknown. Therefore this is highlighted as a knowledge gap.

Regarding your comment on biofouling, Descriptor 4 reflects on impacts from "hot spot" creation (e.g. from blue mussels) where ecosystem dynamics are affected at the local level (see page 47-20)

Reviewer x13: *no comment*

Reviewer x14: pg98-19: I'm not sure about the word "cover". Effect might be better?

RESPONSE: "cover" was replaced with "affect"

Reviewer x15: Page 99 box: “Fishing is the most represented OWF-related cumulative assessment. “ Please explain how fishing is an assessment.

RESPONSE: the sentence was modified as follows: “Fishing is the most represented human activity in combination to OWFs in -related cumulative assessments”

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: *no comment*

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Discussion - Cumulative impacts and effects - Cascading effects that escalate within the ecosystem attributed to cumulative effects (pages 99-100)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: thank you

Reviewer x5: p. 99 l.16 : this focus on cascading effects within the ecosystem is interesting, and probably one of the most interesting conclusions of this study. Integrated modelling at various scales (local, OWF, region) based on extensive monitoring is probably the best way to address such cumulative effects

RESPONSE: thank you

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10:

Good explanation

RESPONSE: thank you

Reviewer x11: *no comment*

Reviewer x12: see above, the same holds for this section (probably these sections can be combined)

RESPONSE: the two sections will not be combined as they deal with different dimensions of cumulative impacts (see section in the introduction on the topic).

Reviewer x13: *no comment*

Reviewer x14: *no comment*

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: thank you

Reviewer x19: *no comment*

Reviewer x20: - Page 100. This is alluded to in the conclusion, but what is the significance behind the uneven geographic distribution of evidence? It is stated in the conclusion that this causes a biased representation of species studied which I think should be stated here. Also maybe some species have regionally-heterogeneous responses to wind farms depending on specific contexts (different population behavior, different interacting stressors, different access to refuge/resources, etc)?

RESPONSE: this sentence was added in the box: "Additionally, more studies in less-represented areas should be conducted to test the generality of current findings in other areas."

Discussion - Cumulative impacts and effects - Plugging knowledge gaps (pages 100-102)

Reviewer x1: P 101, lines 23-25. D8 and D9: Limited evidence exists on chemical leaching from turbine materials (e.g., anti-corrosive coatings) and microplastic shedding from cables. Only two studies measured metal concentrations near OWFs, finding levels below PNEC thresholds.

Add in 'galvanic anodes' in the example as these are different from anti-corrosive coatings which are expoy based and release a suite oif different organic compounds.

RESPONSE: Thank you for your comment. This has been addressed in page 100.

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: p. 100 l.2 : not sure addressing knowledge gaps for fixed OWFs is still the priority, as future very large OWFs will probably be floating ones, far ou very far from the coast where conditions and impacts are very different p. 101, l.22 : for D7, there are intrinsic limitations linked to poor and/or very diverse determination of GES for D7 in many EU member States, that hamper all impacts assessments…

RESPONSE: Thank you for your comment. Given that the scope of the literature used in this report is limited to fixed OWFs, findings regarding knowledge gaps on this technology are relevant to mention. Moreover, even when country interests are increasing towards floating OWFs, currently, the most prominent, mature, and economically viable technologies are still bottom-fixed structures.

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Suggestion: Could include a roadmap or table linking specific knowledge gaps to research actions and policy tools.

RESPONSE: Thank you for that suggestion - given the limited time frame of this request, we opted for not creating a roadmap but will keep it in mind moving forward.

Reviewer x11: *no comment*

Reviewer x12: A number of papers have shown that possible effects are only apparent or measurable after a relatively long time, very often 'after' the obligatory monitoring period. One of the knowledge gaps is the effect size of the presence of the structures on the longer time (when it starts exceeding natural variation).

RESPONSE: [Response here]Thank you for your feedback. It is true that, while there is emerging evidence on the environmental effects of offshore wind farm presence, such as localized habitat changes, species aggregation, and shifts in benthic and pelagic communities, an important knowledge gap remains regarding the cumulative effect size over longer timescales, which has been better highlighted in the text.

Reviewer x13: *no comment*

Reviewer x14: pg 100-13: But surely this is because they are not many OWF in these seas? I suggest adding this clarification. 101-4: Because there has been very little decommissioning'. Again, I would add this clarification. 101-5: This seems to be a really important point that you could make more of. At the very least this warrants being a new paragraph. 101-7: You could also mention litter released during construction, and particularly during operation e.g. paint flakes, micro-particles from the rotor blades. 102:1: Again, are you sure there are 6 OWF decommissioned? 102:1: What about the pre-construction stage? You could mention this stage too as it hardly gets any attention. 102-10: But does the MSFD really consider economic impacts? You could argue that seabed integrity impacts the aggregate extraction or dredging of navigation channels. Is this a cumulative impact or a wider Social-ecological System impact?? I suggest you add a sentence to cover this. 102-20 - What about the UK?! :(Given the number of UK OWF in North Sea and soon Celtic Sea it really needs an eco-region monitoring rather than political boundary scale monitoring.

RESPONSE: Thank you for your very valuable comments. Clarifications to pages 100-13 and 101-4 have been added and more emphasis has been put into pg 101-5. Regarding decommissioning, amendments to the text have been made to highlight knowledge gaps for this activity, removing the number initially added. In page 102-1 the pre-construction has been included as an overlooked stage for OWF development. Regarding 102-10, the MFSD itself does not consider socioeconomic impacts literally, however, in the case of D3 fish and shellfish are included as commercial species groups, which inherently refers to social and economic benefits. However, we mention these as knowledge gaps, referring to the need to bridge such ecological impacts from OWFs to those within the socioeconomic sphere

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: Table caption needs to be more descriptive.

RESPONSE: Thanks for your feedback. A more detailed caption on Table 4 has been added.

Reviewer x18: OK

RESPONSE: [Response here]

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Discussion - Limitations (pages 102-104)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thanks

Reviewer x5: p. 103 l. 9: It is a pity that the rich information of grey literature (including AISs) could not be used. The strong focus on one region (Baltic/North Sea) is a strong limitation, obviously impossible to avoid but that could weaken the conclusions of the study. p. 104, l. 5 : beyond testing of conclusions, not sure the workshop has brought something really interesting (+ see my observation about D7 being in the "wrong" cluster)

RESPONSE: Thank you for pointing out emerging limitations from the findings and retained literature (i.e geographic focus). In our Scoping review, we limited our review to peer-reviewed publications for two main reasons: 1) to ensure consistency, transparency, and objectivity (fundamental principles in research). Conversely, including grey literature (mostly industry-led initiatives) would have introduced challenges in terms of ensuring methodological objectivity. 2) Authors were also constrained by a short policy window that required such decisions in order to control the volume of literature. That said, we fully recognize this as a limitation and have improved the section on Limitations accordingly. We also include a suggestion that future work could broaden the scope to include grey literature. We have added a few lines on the value and scope of the workshop in the relevant sections around methodology and cluster rationale.

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Critique: Limited mention of language bias, grey literature exclusion, or funding influences.

Suggestion: Acknowledge biases in stakeholder representation during workshops

RESPONSE: Thank you for your comment and suggestion. The exclusion of grey literature is noted in the methods section. In the section on Limitations, we have now also included reflections on language and stakeholder representation at the workshop, which are indeed important to highlight.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: No comments

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: Scoping review limitations (P103) could be formatted as paragraphs. Same, but less impactful, for workshop limitations (P104, L21-31)

RESPONSE: Thank you for the suggestion. We have clarified the distinction between the two parts and added separate headers under each sub-section to improve readability.

Reviewer x18: I would highlight here that the focus of the review is on offshore wind farm infrastructure, and not on associated infrastructure extending toward land (including ports and harbours), which could potentially impact coastal habitats

RESPONSE: Thank you for this point, we have now added this to the section on limitations of Scoping Review

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Conclusions (page 75 - 76)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you.

Reviewer x5: (page 105-106) p. 105 l.13 : I agree this is the top priority p. 105 l.27 : it is good that the report mentions the three types of cumulative impacts including cascading impacts, that should be addressed through integrated modelling (cross-sectoral, short/long terme, physical and trophic). p. 106 l. 3: Indeed, reducing cumulative impacts should be THE priority, and may lead to reducing impacts of "traditional" activities (e.g. fishing, agriculture) rather before putting more stringent constraints on the last newcomer (i.e. windfarms)

RESPONSE: Thank you

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Comment: Comprehensive summary.

Suggestion: Break conclusions into descriptor-specific highlights or policy-level versus science-level categories.

Clarity: Simplify dense sentences in Executive Summary and Results.

Balance: Expand under-addressed descriptors (e.g., D9, D2).

Cumulative Framing: Add systems-thinking visuals to integrate cross-descriptor effects.

Future Work: Create a table linking research gaps to EU marine policy instruments.

RESPONSE: Thank you, we have incorporated your suggestions into our structure and collated them with the rest of the reviewer comments.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: 106-9: Was there nothing on resting points for some birds or prey attraction for seals from tagging studies? 106:19 - But if mitigation plans where fully implemented at each stage then we wouldn't have an cumulative impacts. Perhaps better to say monitoring of mitigation measures to understand their effectiveness. 106-23: This is a good point, but I suggest rewording it around saying decommissioning plans should be based on current available technologies with the option of improvement if the technology develops. Currently a lot of EIA's just say they will use the best available techniques at the time of decommissioning. This seems like shrugging shoulders and saying "dunno, we'll figure that one out later".

RESPONSE:106:19 - monitoring is lacking in general. We incorporated the observation about monitoring effectiveness by modifying the sentence of page 107 line 24

106:23- thank you for the constructing suggestion. We have added more detail taking into account the points raised in your comment - see page 108, lines 24-25

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: I think it would make more sense to begin with the findings and then continue with the knowledge gaps.

RESPONSE: thank you for the suggestion, we have shifted the order slightly.

Reviewer x20: *no comment*

Annexes

ANNEXE 1 - Ethical considerations for methods (pages 117-120)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: p. 117 l.9 : "participants will not be remunerated for their time to avoid financial motivations for participating that may bias their inputs." : are you sure that working only with people already paid by their institutions or by the industry (=that can allocate time to this work, as they are already paid..) is the best way to avoid biases ?

RESPONSE: Thank you for raising this important point. The decision not to offer remuneration to workshop participants may have unintentionally biased participation toward individuals who are already salaried or institutionally supported, and thus have the flexibility to engage without additional compensation. However, our rationale for not offering payment was to reduce the risk of financial incentives influencing the content of participants' responses. We have now added this point to the report in the section on limitations.

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Pages 117–120

Clarity & Structure:

Generally well-written with clear structure across participatory design, privacy, and bias reduction.

On page 117, lines 12–21, the report notes "anonymity and confidentiality" for workshop participants. However, it could clarify whether indirect identifiers (e.g., institutional affiliations) were also redacted.

Suggestion:

Expand on how informed consent was obtained in virtual vs. in-person formats (p.118, lines 6–16).

Include data retention period and data protection policies, especially under GDPR compliance.

RESPONSE: Thank you. While we have ensured the anonymity and confidentiality of individual participants by omitting names and direct identifiers, we allowed participants the option to include their institutional affiliations. This was a deliberate choice aimed at reflecting the breadth and diversity of sectoral participation, which we believe provides valuable context for the analysis. In line with best practice, written consent was secured for participation, recording, data storage, and declarations of any conflicts of interest. As mentioned in the report, all data are collated and managed in accordance with Eklipse's data collection and storage protocols, retained for five years, and then permanently deleted.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: No comments

Reviewer x15: Why write in future tense if this was in the past? It could now also be more specific, with have been recruited from x,x, and xx, instead of "will be recruited from e.g. x,x, and x.

RESPONSE: Thank you for pointing this out. We have now changed the tense.

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

ANNEXE 2 - Ethical approval (page 121)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Page 121

Comment:

States that ethical approval was not legally required, citing the Eklipse protocol and type of data collected.

Suggestion: On line 6, mention whether any internal institutional review board (IRB) or data protection officer was consulted. Transparency would enhance legitimacy.

RESPONSE: Thank you. We have mentioned the following in the report (page 16, lines 13-15): "Ethics approval for the workshop was obtained from the Ashoka Trust for Research in Ecology and the Environment (reference: IRB/OTH/001/SBh/04/2025; Annexe 2)."

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: No comments

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

ANNEXE 3 - Keywords for SR based on descriptors of GES as stated in article 8 of the EU Commission on GES 2017/848 document (pages 122-128)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Pages 122–128

Strength:

Impressively detailed keyword matrix for systematic review, organized by descriptor and nested concepts (e.g., pressures, impacts).

Clear distinction between environmental state descriptors and human pressures.

Comment (p.122–123):

Lines 9–26 include compound keyword structures using boolean operators (AND/OR). Good practice, but would benefit from examples of actual query strings used in Scopus or WoS.

Suggestion:

Group keywords in a table with additional fields like “database used,” “number of results,” and “refinement steps.”

RESPONSE: Thank you for the feedback

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: It could be worth mentioning that Latin names were not used. I wonder if this could have missed some papers. But I am definitely not suggesting doing the search again using Latin names!

RESPONSE: RESPONSE: Thank you for your comment. This has been addressed.

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

ANNEXE 4 - Scoping process (pages 129-133)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Pages 129–133

Comment: Provides transparency on the evolution of descriptors used in the SSS process. Good use of Figure A4.1 on page 130 to explain cluster transitions.

Critique: Some overlap in descriptors and criteria noted on page 131, lines 8–18 could benefit from a clearer explanation of how redundancy was resolved.

Suggestion: Add a flowchart showing how input from WP2 and external experts fed into scope refinement.

RESPONSE: Thank you for your suggestion regarding the flowchart and to reflect on the scope refinement. While this is an issue definitely worth reflecting on we don't believe that the report as it stands is the right place for it, that would rather go into a reflection or methods paper on the processes itself.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: pg 129 - D11: you say all energy but I don't think you've mentioned anything about light or shading effects. Suggest rewording this.

RESPONSE: Thank you for your comment. Energy is included in the name of the Descriptor, according to the EU MSFD. Therefore, even when the majority of our results are based on underwater noise assessments, we can not change the official name of the descriptor. However, we have included light and electromagnetic fields (both as anthropogenic sources) as part of our findings for knowledge gaps. Shading or natural light exposure effects to the water column are not included in this Descriptor, please see D5 and D7.

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

ANNEXE 5 - Institutions identified initially as holding relevant expertise (page 134)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Page 134

Comment:

Useful list for transparency in stakeholder mapping.

Suggestion: Consider grouping institutions by type (e.g., government, academia, NGO) and geographical region for better interpretability.

RESPONSE: Thank you for this suggestion, while we identified organisations and actors in the spirit of transparency this is not an exhaustive list, to allow for groupings like you are suggesting, a more exhaustive list would be needed to allow for an objective representation, this is beyond the scope of this report.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: Not sure how useful this is. There are a lot of organisations missing. Why list those initially identified?

RESPONSE: Thank you for the feedback. We listed the initially identified organisations in the spirit of transparency and to document the early scope of our mapping process. However, we acknowledge that the list is not exhaustive.

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

ANNEXE 6 - Workshop information (page 135)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: Why no environmental NGOs have been invited to contribute ?

RESPONSE: Please refer to Annexe 5 which provides a fuller picture of sectoral representation, including NGOs and other relevant actors.

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Page 135

Comment:

Concise summary of workshop format, tools (e.g., Padlet, Google Jamboard), and breakout structure.

However, limited detail on moderation strategies.

Suggestion:

On line 10, elaborate on how divergent viewpoints were moderated and integrated into consensus mapping.

RESPONSE: This was facilitated by the cluster facilitators, who helped guide the discussions, while the plenary sessions provided space to surface any disagreements. Commitments and key points from the discussions were noted on a shared board. Additionally, participants had an equal opportunity to raise topics based on pre-session comments.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: No comments

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

ANNEXE 7 - Workshop agenda (page 136)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Page 136

Comment:

Clear daily structure; tasks are defined and appropriately sequenced.

Suggestion: Use of color-coding or time blocks (e.g., 09:00–10:30) would make this easier to read quickly.

RESPONSE: Many thanks for your suggestion. Your commnet will be consider in the formatting phase.

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: No comments

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

ANNEXE 8 - Workshop information references per cluster (pages 136-144)

Reviewer x1: *no comment*

Reviewer x2: *no comment*

Reviewer x3: *no comment*

Reviewer x4: OK

RESPONSE: Thank you

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: *no comment*

Reviewer x8: *no comment*

Reviewer x9: *no comment*

Reviewer x10: Pages 136–144

Strength:

Extremely detailed—each cluster's conceptual reference list is supported by thematic bibliographies.

Useful for validating the knowledge base used in workshop design and SSS alignment.

Critique:

The presentation is very text-heavy. No synthesis or categorization of types of sources used (e.g., meta-analyses, review articles, policy reports).

Suggestion:

For each cluster (e.g., Cluster 1 on pages 136–137), provide a brief paragraph summarizing thc main narrative or consensus found in cited references.

RESPONSE: Thank you for your comment and suggestions. We have now balanced the text with visuals. Regarding the participatory workshop, the aim of this exercise was not to generate a new body of evidence (though it did lead to the collection of some additional references), but rather to validate and reflect on key findings from the existing summaries and reviews, and to help identify critical gaps. With this in mind, an in-depth review of additional *references suggested at the workshop stage is not covered in the workshop summaries, but has been added to Annexes.*

Reviewer x11: *no comment*

Reviewer x12: no comments

Reviewer x13: *no comment*

Reviewer x14: No comments

Reviewer x15: *no comment*

Reviewer x16: *no comment*

Reviewer x17: *no comment*

Reviewer x18: OK

RESPONSE: Thank you

Reviewer x19: *no comment*

Reviewer x20: *no comment*

Any other comments?

Reviewer x1: My thanks to all the team for the comprehensive report. It is a huge amount of work and should prove very valuable.

RESPONSE: Thank you.

Reviewer x2: *no comment*

Reviewer x3: review still in progress

Reviewer x4: Absurd not to include this study: https://mareco-odnature.naturalsciences.be/project/outflow/

RESPONSE: Thank you for pointing this out. As part of our scoping review, we followed a structured search process using defined keywords to help cast a wide net. However, we acknowledge that despite these efforts, some relevant studies—such as the one you've highlighted—may have been unintentionally missed.

Reviewer x5: *no comment*

Reviewer x6: *no comment*

Reviewer x7: I was not able to complete the whole review, due to other commitments. I apologize for that

RESPONSE: Thank you.

Reviewer x8: *no comment*

Reviewer x10: Thank you.

RESPONSE: Thank you

Reviewer x11: *no comment*

Reviewer x12: *no comment*

Reviewer x13: I will limit myself below to comments on Descriptor D1 – marine biodiversity, as my knowledge of the other descriptors is insufficient.

Since this review focuses solely on the scientific literature and does not include grey literature, nor key websites such as national GES reports or OSPAR assessments, the vast majority of the knowledge regarding the impact of offshore wind farms on marine biodiversity (Descriptor D1) is not taken into account. The authors acknowledge this in several places in the report, but it remains a missed opportunity, as the review is therefore far from complete and presents a very general view of the impact of offshore wind farms on marine biodiversity, both at a local scale and in terms of cumulative effects. It is difficult to quantify precisely, but in any case, more than 95% of the existing knowledge is contained in grey literature, often in the form of reports (typically monitoring studies sometimes with a long-term character, knowledge syntheses, and modelling studies), or in a few review studies published in book form. The workshop that was held was obviously far too short to capture this unaccounted-for knowledge, and Annex 5 further shows that the institutions involved in the workshop only partly overlap with the research institutes that have actually conducted impact studies in Europe or institutions that performed the resulting model simulations to calculate population effects. As a result, the findings in this report, along with the derived recommendations and conclusions, remain rather general, biased by the studies of only a few institutes that have produced peer-reviewed (A1) publications—often from some years ago—and are at times fairly self-evident (e.g., some bird species lose part of their habitat and others experience increased mortality). Consequently, the real translation of these findings into an assessment of the achievement of GES remains largely unanswered and the added value for European policy on offshore wind energy is rather limited. Instead, the emphasis is placed primarily on knowledge gaps, which is of course important, but does not correspond to what the report title suggests—namely, a synthesis of existing knowledge and an estimation of progress toward achieving GES.

Finally, I found it quite inconvenient that the literature references in this draft report are not accompanied by publication years, and that some citations mentioned in the text are missing from the reference list.

RESPONSE: All in-text citations have now been cross-checked to ensure consistency with the reference list, and publication years have been added where missing.

Reviewer x14: N/A

Reviewer x15: Some of my concerns are written in more than one place, but I do not know how you distribute your work, so I played safe. Forgive me repetitions if you come across them.

While being a strong and to my knowledge unique collection of data, and the immense effort of the authors is clear and has led to a useful product, the product could benefit immensely from sorting it a bit more. Bundle but keep clearly separated: limitations, knowledge gaps and future recommendations for each Descriptor and make a separate cross-descriptor interaction chapter and a summary. Discussion would also be better integrated into descriptor chapters. I doubt the usefulness of presenting the results from scoping review and the participatory workshop separately. I would prefer if they were integrated. This should be an applicable summary for policy makers, not a testimony to the power of the workshop/their participants. For that purpose, a sorting of the findings to the Descriptor chapters or a Descriptor interactions chapter would be better. It would be sufficient to single out the general descriptions of the workshop activity and how that helped, such as done in page 94, lines 10-24.. There are also repetitions, which could be removed to contribute to conciseness. Mentioning of the participatory workshop should be bundled and not turn up multiple places.Generally, the different descriptor chapters could have a harmonized form of presentation of knowledge gaps and maybe also recommendations, maybe as Table.

The chapters on D1, D3, D4, D5 and D6 should be integrated and cross-references with each other, as they have significant overlap. Can be done in text, or pages 41, 57 and 64 (links…) show one possibility how this can be solved. Page 48 seems to do the same, but harmonized headings could help to retrieve this easier for the reader. Page 64 links should be a bit better described. Are those suggestions or shown data? I suggest to not only list what to observe, but what was observed. Example: not only "changes in macrobenthic communities at a larger scale," but type of changes that were observed. This would also help to emphasize the need for more holistic effect analysis, as stressed on page 94, lines 25-32.

I am concerned that the many demands for offshore wind parks cannot be met if alternative sources for energy (e.g. oil industry) are not obliged to deliver the same demands. There is a potential for stifling the effort of a better way to gain energy by unfair distribution of demands. This should be centrally discussed in my opinion, to not make the situation worse with good intentions. Objectives lack a comparative analysis of alternative scenarios. It would be beneficial to compare the impact of OWG with impact of alternatives for similar energy gain or impact of less energy gain. This might be out of scope for this review but could be proposed for follow up.

Potential of animals attracted but not reproducing – maybe discuss?

Finally, I'd like to congratulate the authors on their great and comprehensive work! It will become a really good product! I hope you are encouraged to go the final mile - sorting a bit better - to maximize the impact!

RESPONSE: Thank you for the suggestions. The results from the scoping review and the participatory workshop were presented separately to maintain the distinction between evidence derived from structured literature-based analysis and insights generated through stakeholder engagement. This separation ensures transparency in methodology, highlights the different types of knowledge (evidence vs opinion-based) each approach brings, and allows readers to better understand how formal scientific evidence and expert or practitioner perspectives complement one another.

Reviewer x16: Thank you for compiling this very good report. I realize that it focuses only on fixed-bottom windfarms and thus maybe my comments bellow do not apply. I'd like to point out the following topics for your consideration (under knowledge gaps): (D1)(D11) - harbour porpoise in the iberian peninsula the population is different (genetics, habitat use, abundance) from populations in more northern areas where all previous studies were performed. Therefore, results obtained for the harbour porpoise in other countries can not be assumed in the future for the iberian harbour porpoise population. This should be considered a major knowledge gap, particularly due to the population's negative conservation status in Portugal (CR) and in Spain (EN) (and in Habitats Directive article 17), which cannot endure any further habitat loss (particularly expected from cumulative and cascading effects). - Beaked whales (deep divers, using continental shelf slope in some european regions, e.g. Ziphius, Mesoplodon): you mention the lack of info for baleen whales, dolphins other than porpoises; beaked whales may also be an important group in some regions. (D8) - was there any info on potential contamination during dismantling? Should dismantling be taken into consideration as in other offshore-built infrastructure? Thank you very much. Best regards

RESPONSE: Thank you for your comments. In response to your question about Descriptor 8 (D8), there was no information from the scoping review on potential contamination during decommissioning of OWFs. One of the common themes that emerged from the participatory workshop and stated in the report is the limited research on the decommissioning phase for OWFs which likely contributes to significant yet poorly understood impacts.

Reviewer x17: *no comment*

Reviewer x18: Congratulations on the hard work in compiling this information and writing the report. This will be a useful document and also an important piece highlighting the need for a better understanding of the impacts of offshore wind development.

RESPONSE: Thank you.

Reviewer x19: Congratulations for this nice report!

RESPONSE: Thank you.

Reviewer x20: Thank you for all your excellent work on this report. It represents a massive effort and my experience as a participant in the expert consultation was very productive and rewarding. It was great to see how these insights were used to complement the findings of the review in such a successful manner.

RESPONSE: Thank you.